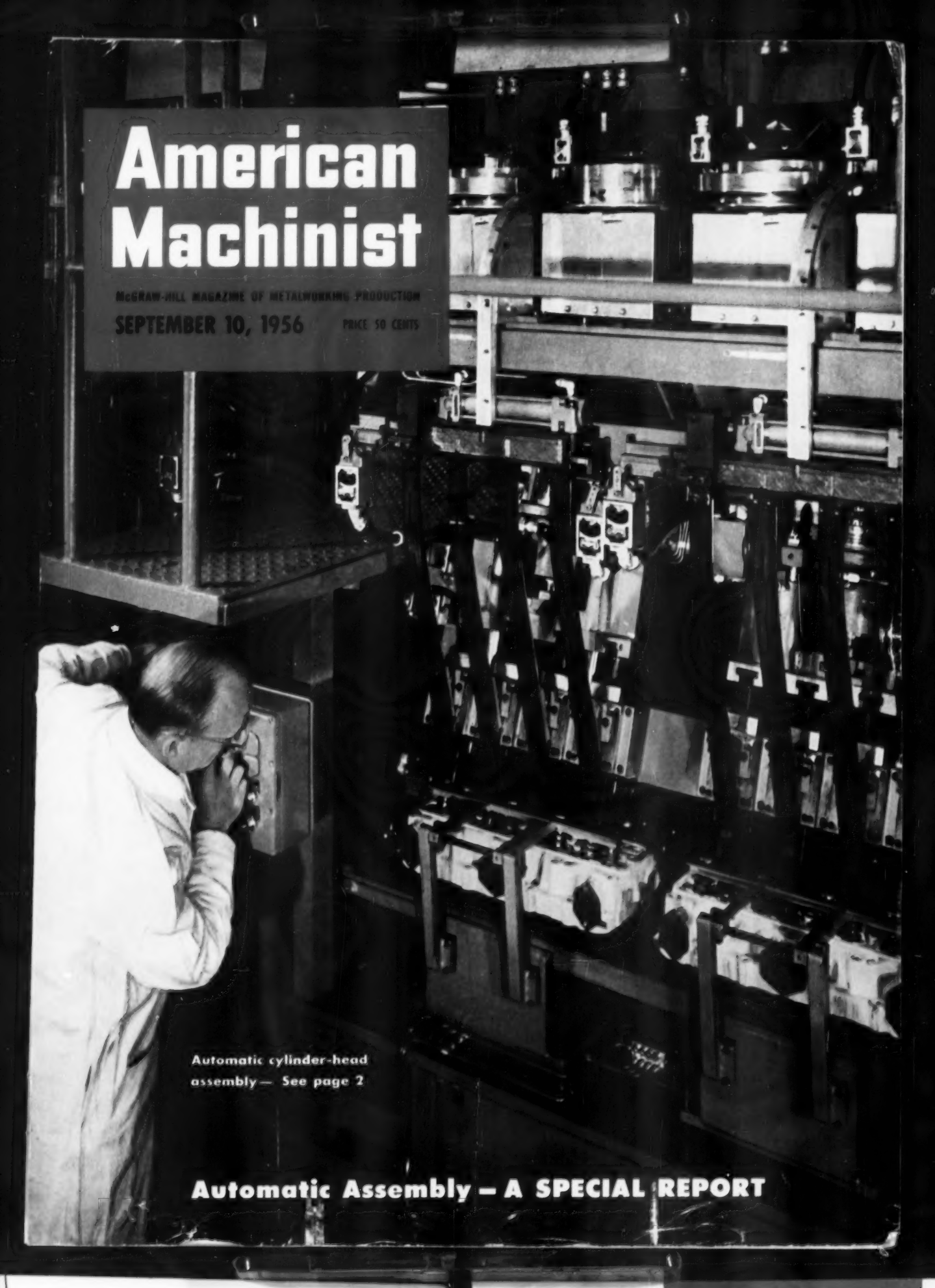


# American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
SEPTEMBER 10, 1956 PRICE 50 CENTS

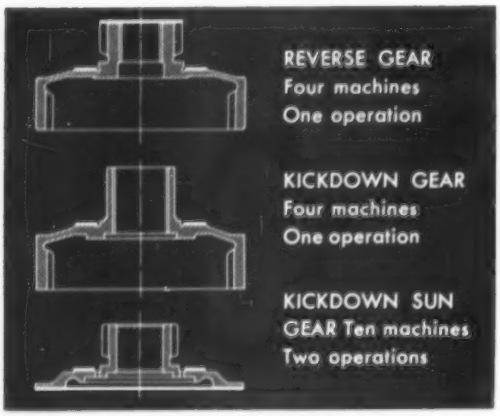
Automatic cylinder-head assembly— See page 2

## Automatic Assembly — A SPECIAL REPORT

**Heald VERSATILITY in action**

# How STANDARD Rotary Surface Grinders do a PRODUCTION-LINE JOB

## Eighteen Model 261s surface grind 3 different automatic transmission parts on a high-production basis




PRODUCTION-LINE speed and tool-room precision go hand-in-hand on a Heald Model 261 Rotary. Its automatic features make it an ideal machine for long runs of identical parts. This is well illustrated by an 18-unit lineup of 261s in a fast-moving production line at a large automatic transmission plant. These *standard machines* are surface grinding the three different gears shown at the left. All 18 machines have 12" chucks and magnetic workholding is used for all but one of the operations. The number of machines used for each operation depends on grinding time per part and required hourly production. There are 15 *other* Model 261s in this same plant, doing both *production-line* and *tool-room* work.

Available as either a Plain or Automatic cycle machine, the Heald 261 easily meets every requirement for long or short run rotary surface grinding work. For complete information, send for Bulletin No. 2–261–2, Issue 3.

*It PAYS to come to Heald.*

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**THE HEALD MACHINE COMPANY**

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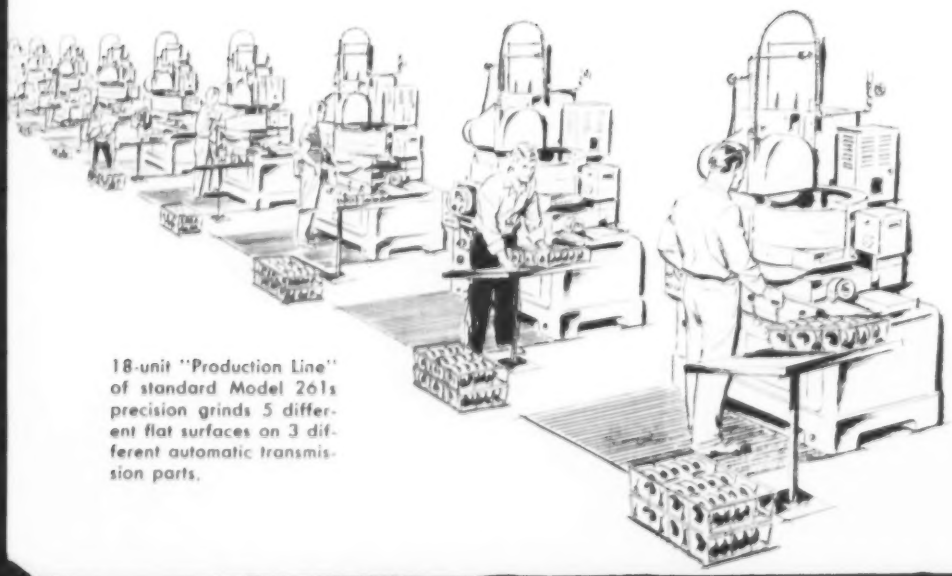
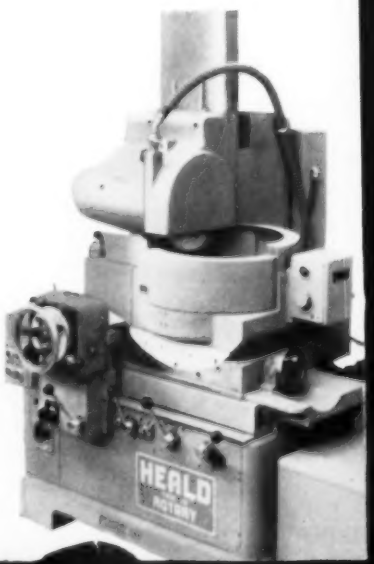


18-unit "Production Line" of standard Model 261s precision grinds 5 different flat surfaces on 3 different automatic transmission parts.



# American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION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SPECIAL REPORT NUMBER 430

**Automatic assembly, the latest in automation . . .** Trend is fully automatic assembly of products ranging from small electric motors to auto engines. This report combs current practice to report on problems and advantages. It gives case histories of automatic assembly machines, shows how they work, what they put together, and the results obtained. *By George De Groat*.. **133**

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# American Machinist *Chips*

***Cover . . .***
Cylinder-head assembly machine developed by Process Development Section at the GM Tech Center for Oldsmobile. For more about the machine see the Special Report starting on page 129.

***And now assembly . . .*** In the eight years since Del Harder's new word *automation* first saw print (and it was in *American Machinist*) the word has come to mean many things to many people. It has been used and misused. Most recently it has been broadened logically to include automatic assembly.

***Automatic assembly*** has been growing slowly for a long time (we described one machine for this purpose about 30 years ago) but early this year there was a sharp increase in the rate of development. We had been hashing over the prospects in this field for some time at staff meetings and reporting individual cases where we could.

***Now it was time*** for a major effort to round up all the available information on the subject and put it in a single package that would give perspective to the individual examples. Because much of the work seemed to be centered in the Detroit area, it was logical to have George De Groat, our Detroit editor, handle the job. George combed Detroit, but before he was through his sources ranged from New York to California.

***One of the most spectacular*** examples is the cylinder-head assembly machine built for Oldsmobile. A close-up of one portion of this machine is shown on our cover. Because the machine was too long to show fully in the limits of our normal page, we had to provide a foldout at the start of his Special Report on automatic assembly to make it easy for you to see just what this machine does. You'll find it on page 129.

***Speaking of automation*** reminds us of the hot summer day, much like the one on which this is written, when we first heard the word. That was in 1948, and Rupert Le Grand had just returned from a visit of several days duration at Ford's Rouge Plant. He was full of enthusiasm for Del Harder's new concept and the 16-page story he wanted to run called "Ford Handles by Automation." We had one of the more violent arguments within memory about whether automation was a word or not. But Rupert is a stubborn man. He won the argument and we published the story with the word in the title, followed it with other stories on new developments in automation. Several years later our persistence was rewarded when others began to use the word and now you'll find it in the newer dictionaries.

***Overflow experiment . . .*** When we saw the manuscript for Nordhoff's article and the dozen tables needed to apply the data properly, we were faced with a problem. To publish the article without all the tables would make for little use to the man who really wanted to take advantage of the method, but to publish them all would take more space than could be spared. Tell us how you like our solution to the problem, which you'll find on page 118.

***Coming . . .*** *AM* for September 24 will be our Metal Show Issue. In addition to descriptions of new equipment to be seen at the Metal Show in Cleveland, October 8-12, most of the articles will deal with appropriate subjects. They will include such subjects as surface hardening, pit furnaces, salt pots, induction hardening on a screw machine, electroforming, drawing titanium, and carbide dies for heat-treated stock. The Special Report will deal with experience in working the new molybdenum alloys.

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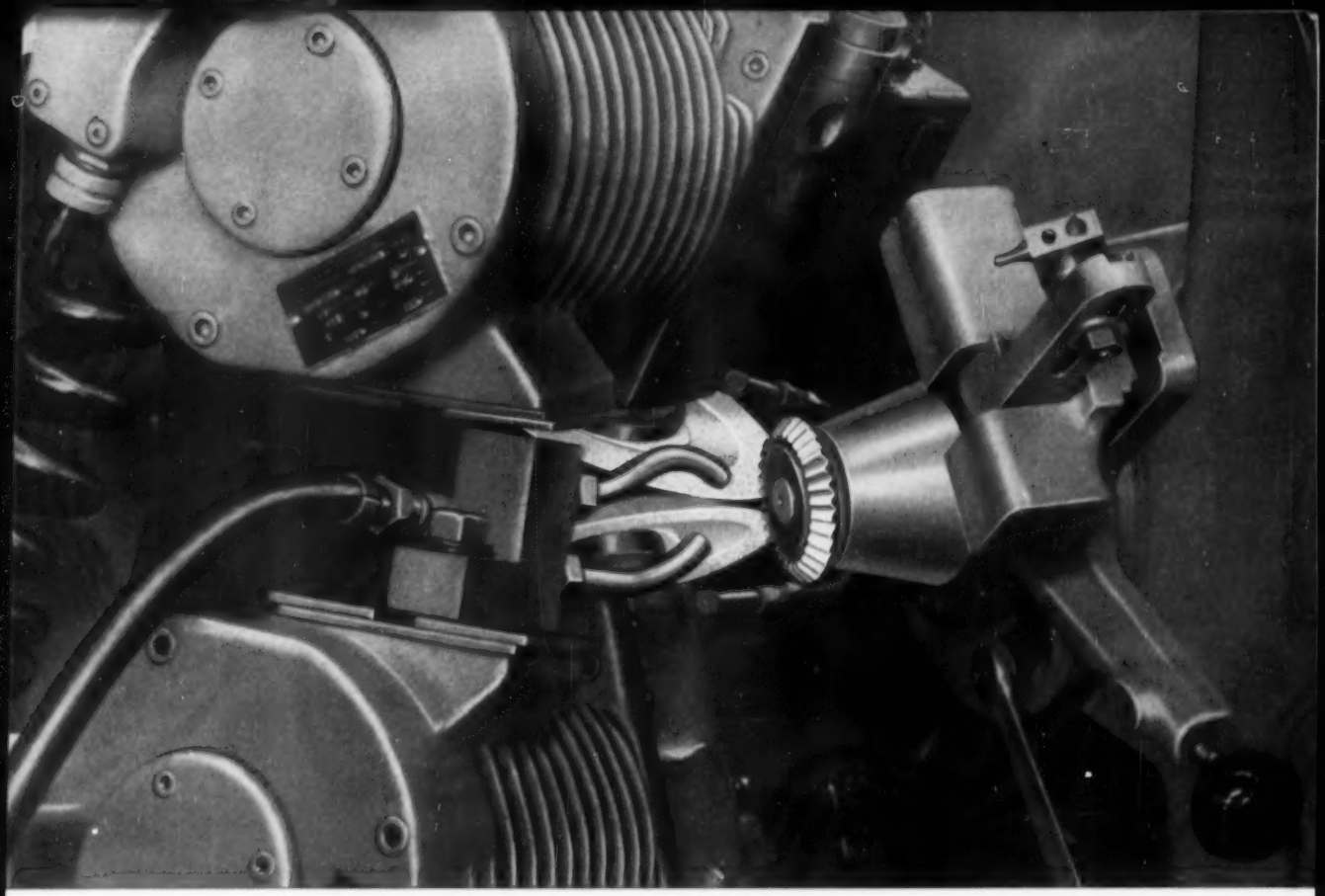


# Now you can grind straight bevel Coniflex® gears

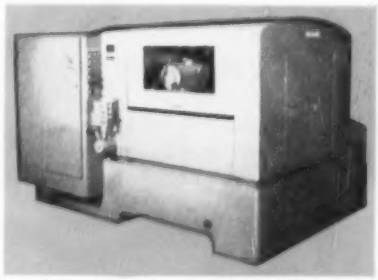
You can *now* use hardened and ground straight bevel gears for many angular drives requiring extreme precision and load carrying capacity.

The new Gleason No. 105 Straight Bevel Coniflex* Grinder generates gears with the highest accuracy of spacing and profile, with the tooth profile, fillet radius, and tooth bottom formed into one smooth blended shape by two grinding wheels.

And gears ground on the No. 105 Grinder after hardening *maintain their extreme precision* even under continuous load operation.

Wet-type grinding on this machine provides fast cycles and excellent finish. Set-up calculations are simple. The completely automatic cycle of the No. 105 Grinder not only assures uniformity of production but also provides great savings in time and production costs.

We will gladly send you more information about the No. 105 Straight Bevel Coniflex Grinder upon request.



*The No. 105 Grinder accommodates straight bevel Coniflex gears up to 8½" pitch diameter, 3DP with ratios up to 6:1, cone distances up to 4¼". Gears 20DP and finer may be ground directly from the solid; coarser pitches are ground after semi-finish cutting and hardening.*

* Straight bevel gears with localized tooth bearing.

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*Builders of bevel gear machinery for over 90 years*

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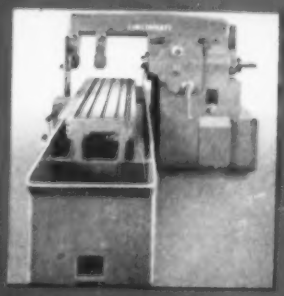
## make quick work of your

Convenient, compact grouping of operating controls reduces fatigue. HyPowermatic design will make a big hit with your operators.

Hardened and ground table ways and square gib construction add their share to HyPower matic's high cutting capacity.



Chip catcher bed design keeps the floor clean. Chips and cutting fluid stay where they belong,

# HyPowermatics

## heavy duty milling operations

Machining costs will tumble when you assign your heavy duty milling operations to CINCINNATI® HyPowermatics. They have the capacity to remove metal quickly; they have new control features that help the operator turn out more work with no increase in effort. Reasons why are numerous:

1) Infinitely variable table feed rates, ¼" to 150" per minute
2) Hydramech table drive . . . assures uniformly smooth feeding motion
3) Built-in backlash eliminator . . . for down-milling and up-milling jobs
4) Automatic spindle stop . . . reduces occupational hazard
5) Automatic two-way table cycles
6) J.I.C. hydraulic and electrical standards
7) Unit type construction, two styles and 42 sizes of each of plain and duplex styles . . . an extra wide selection to fit your requirements

Eleven additional highlights of design and complete specifications for all HyPowermatics will be found in new catalog No. M-1909. Ask for a copy today . . . compare . . . and you'll see why CINCINNATI HyPowermatics can make quick work of your heavy duty milling operations.

**THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO**

Milling stainless steel turbine buckets two at a time on CINCINNATI HyPowermatic. Cuts are ¾" deep x 2" wide. Cutting speed is 56 fpm, feed rate 4" per minute.

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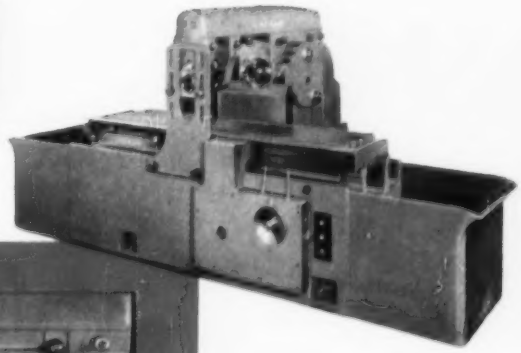
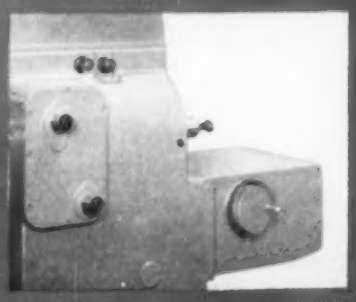


**CINCINNATI HyPowermatic Milling Machine.** Built in plain (No. 420-184 illustrated), duplex and tracer controlled styles, up to 50 hp and 168" table traverse. Catalog No. M-1909.



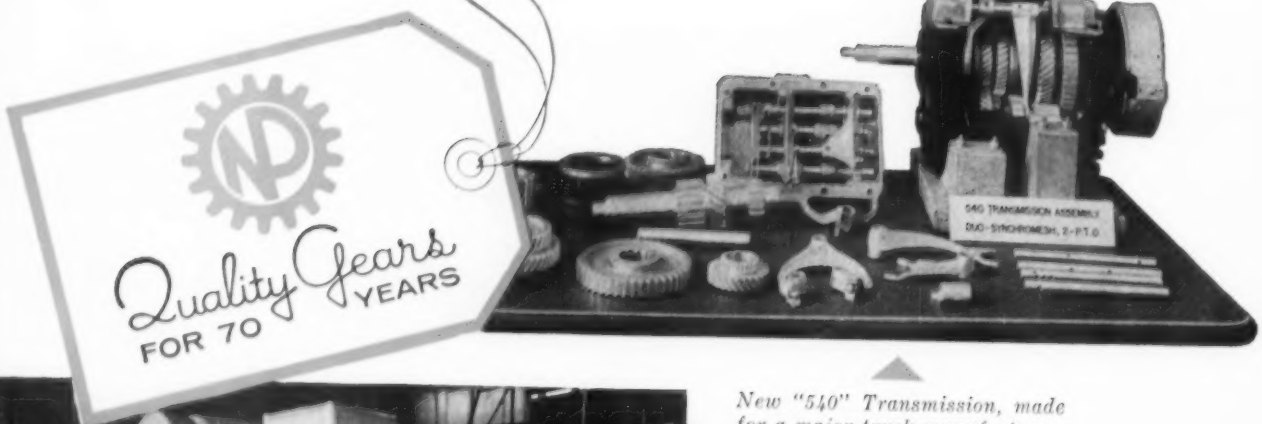
Changing spindle speeds quickly is no problem for low production setups. Quick change spindle carriers are available at extra cost.

Save the smooth surface made by face milling cutters, with Automatic Quill Retraction (optional equipment at extra cost).

CINCINNATI

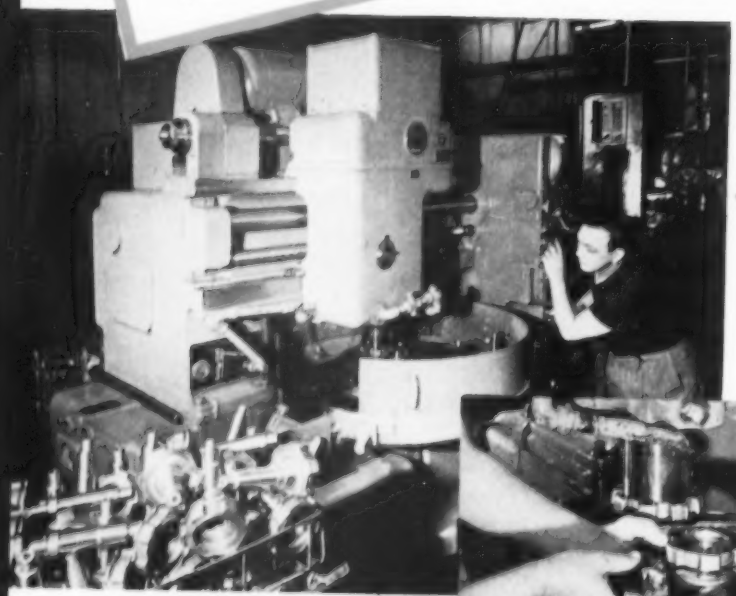
# JUST THE TICKET for Versatility

## FELLOWS GEAR




Quality Gears FOR 70 YEARS

*New "540" Transmission, made for a major truck manufacturer, includes 22 gears . . . all produced on powerful, accurate Fellows Machines.*



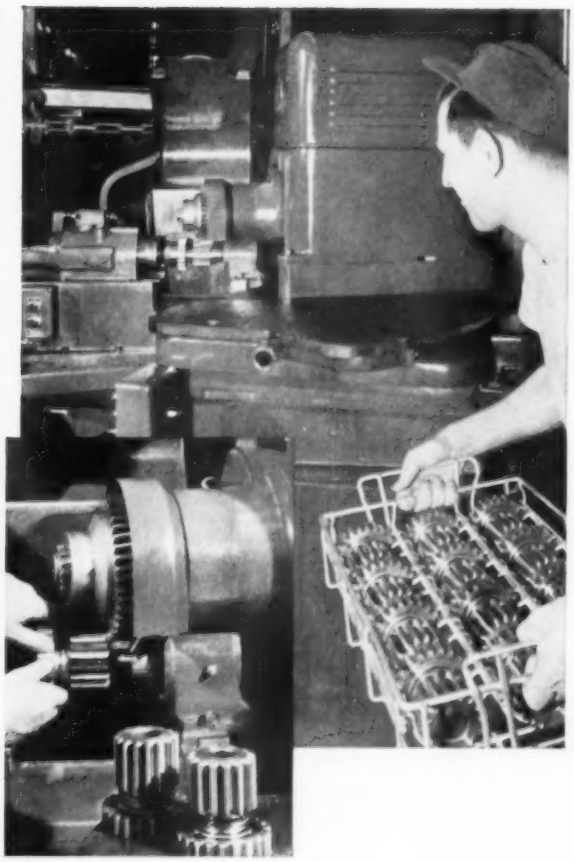
*Fellows 36-Type Gear Shaper cuts all six lugs on this part in one operation . . . produces 135 finished parts per day.*

*Fellows No. 8 "Full-tool" Shaver produces 40 pieces per hour compared to 25 on previous machine.*

THE PRECISION LINE

# and High Production...

## PRODUCTION EQUIPMENT



Products as varied in size as sewing machines and truck transmissions are made at the famous New Process Gear Company, major gear manufacturers for seventy years. They rely on versatile Fellows Gear Production Equipment for higher production schedules, increasing production and cutting costs more than 50% on many gears.

For example, Fellows 36-Type Gear Shaper, with a capacity up to 36" P.D., turns out gears in as little as *one-fifth* the time of the machine it replaced! Fellows No. 8 "Full-tool" Shavers increase production over 60% on most jobs. Semi-automatic fixture controls cut loading time nearly 50%. Other Fellows machines produce comparable savings on many New Process jobs.

For full information about the benefits of the complete Precision Line of Fellows Gear Production Equipment, get in touch with your Fellows Representative. Ask him, too, about the Fellows Plan for deferred payment. Write, wire, or phone any Fellows office.

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78 River Street, Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2
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Fellows *Gear Production Equipment*

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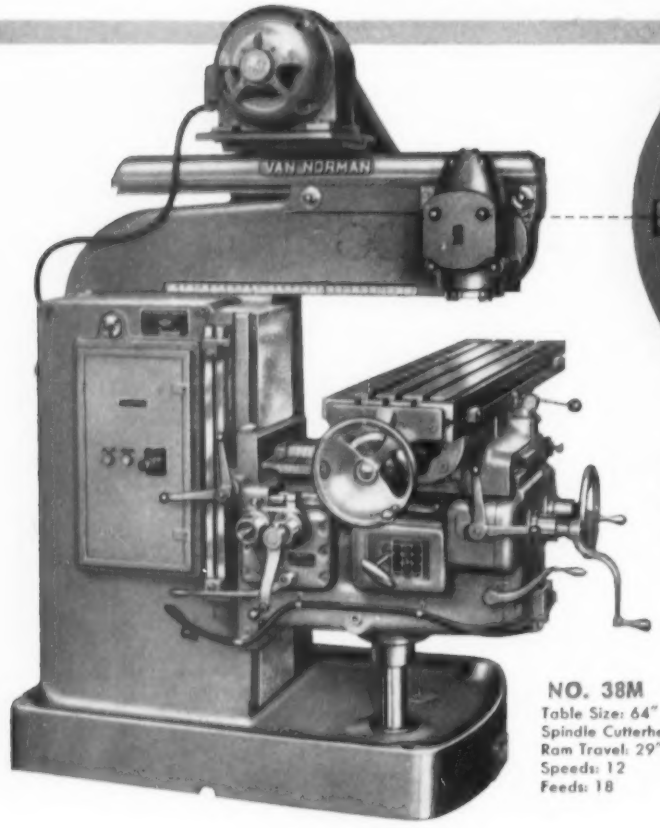
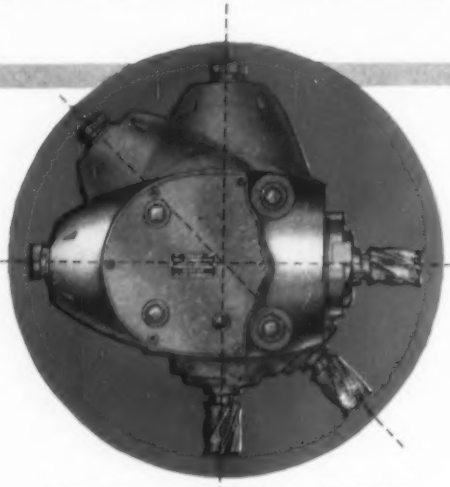
***One Van Norman Ram Type Miller Gives You the WORKABILITY of TWO Single Purpose Machines PLUS Angular Milling***



**Van Norman exclusive adjustable cutterhead permits horizontal, vertical or angular milling on one machine without attachments.**

This No. 38M big three purpose miller costs you only $1.07 per hour to own after minimum down payment on a 5-year-conditional sales contract.

**NO. 38M**
Table Size: 64" x 14"
Spindle Cutterhead motor: 10 HP
Ram Travel: 29"
Speeds: 12
Feeds: 18

# VAN NORMAN MACHINE

**MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.**

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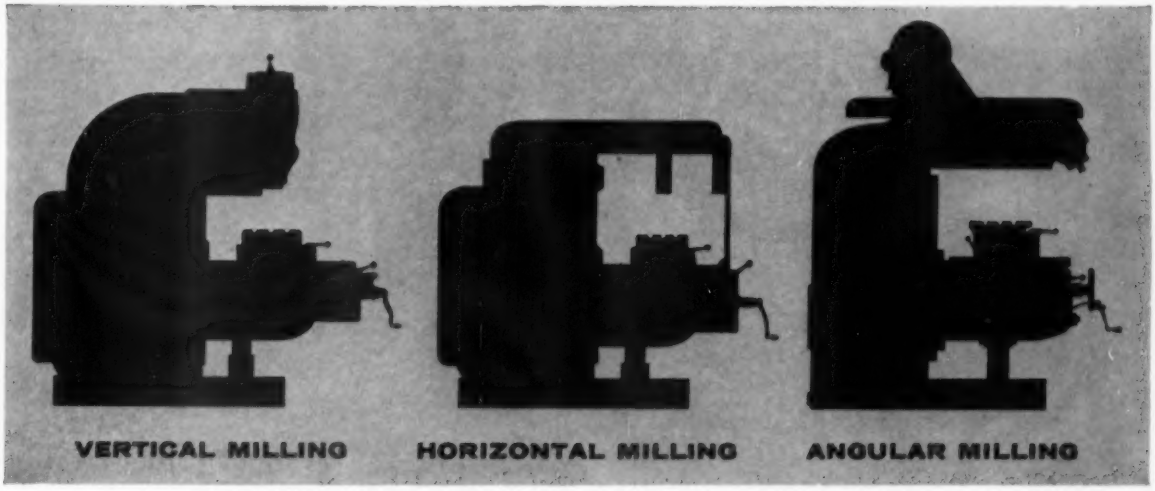
## Saves Your Machine Dollars...




### You do them all on one Van Norman Ram Type Miller

Regardless of the type of plant or type of work, a Van Norman Ram Type Miller can cut your milling costs and speed production. These versatile millers reduce idle machine time by as much as 50%.

But that's not all — with a Van Norman you save on capital expenditures, too! Here's how — with one Van Norman Ram Type Miller you can do horizontal, vertical as well as angular milling without attachments . . . all on *one* machine. This means less machine purchase dollars needed, more overall production from each miller because there is *no waiting* for single purpose machines.

Find out how you can profit with a Van Norman Ram Type Miller. They are available in 14 basic models . . . a size to meet your particular requirements.

Write for full information, today.

*Don't wait . . . for extra profits, install a Van Norman now!*
*They are available on many purchase plans — Outright sale . . .*
*Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate.*
*See your dealer or write Van Norman Company.*

*Conditional Sales Contracts not available to Export.*

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SPRINGFIELD 7,
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# TAPERED THREADS

## produced with *LOW* Tool Cost

## by receding *TAP*

"Receding action" enables the LANDIS LL Tap to thread 4000 W-S pipe fittings per grind at production rates to close tolerances.

This action produces a tapered thread of great accuracy because it mechanically withdraws the chasers from the work at a rate equal to the taper of the thread being produced. Cutting strains are reduced, a true conical thread produced, thread finish improved, and chaser life lengthened.

W-S pipe fittings are produced by the Watson-Stillman Fittings Division of the H. K. Porter Co., Inc. (Roselle, N.J.) for high pressure pipe lines. In the particular operation illustrated, two LANDIS LL Rotary Taps on a special drilling and tapping machine are threading Forged Steel Pipe Elbows. 2" 11½ pitch ASTP threads are tapped at 35 s.f.m.—with 4000 threads completed between chaser grinds.

The LL Tap is also well-suited for threading Stainless Steel. Its cutting action is limited to the throat section or chamfer of the chaser, tapping the thread quickly with little cold-working. As on all LANDIS Taps, detachable heads allow each size of Tap Body to produce a wide range of thread diameters.

For further information, send specifications and ask for Bulletin G-95.

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WAYNESBORO • PENNSYLVANIA • U.S.A.

# Landis centerless grinder permits without loss of

No. 12 Centerless Grinder

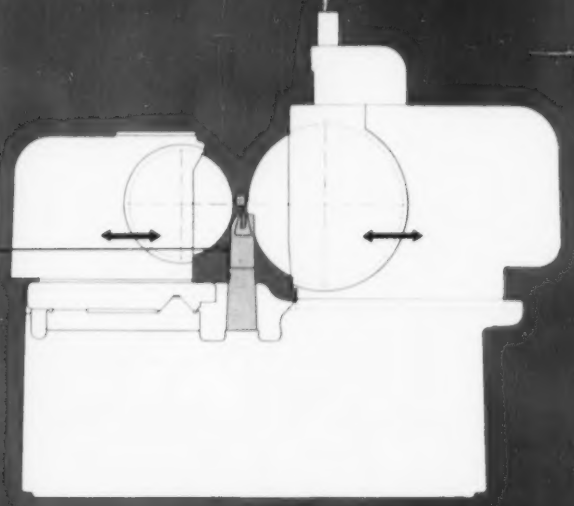
**LANDIS**
precision grinders

# *heavy cuts*
# accuracy or finish

**Exclusive Landis method of centerless grinding:**

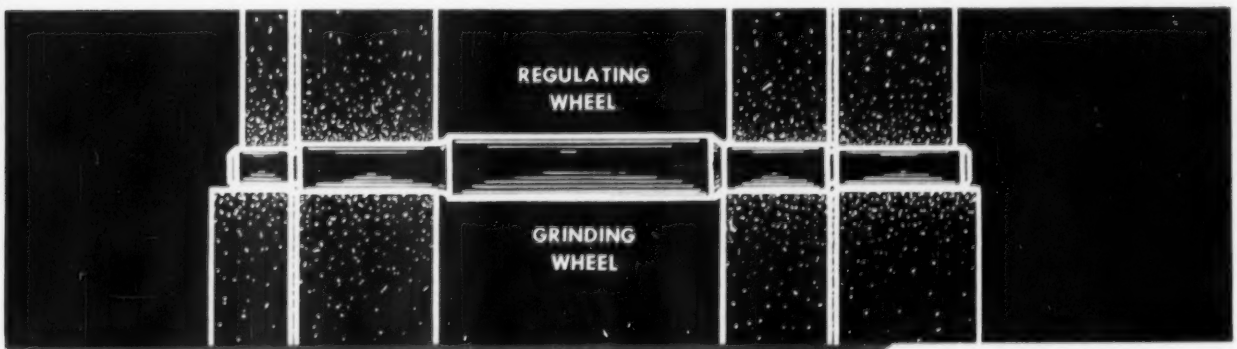
**Work rest remains stationary... grinding and regulating wheel heads move on hand-scraped ways.**

**Rigid, bed-mounted stationary work rest for maximum support**



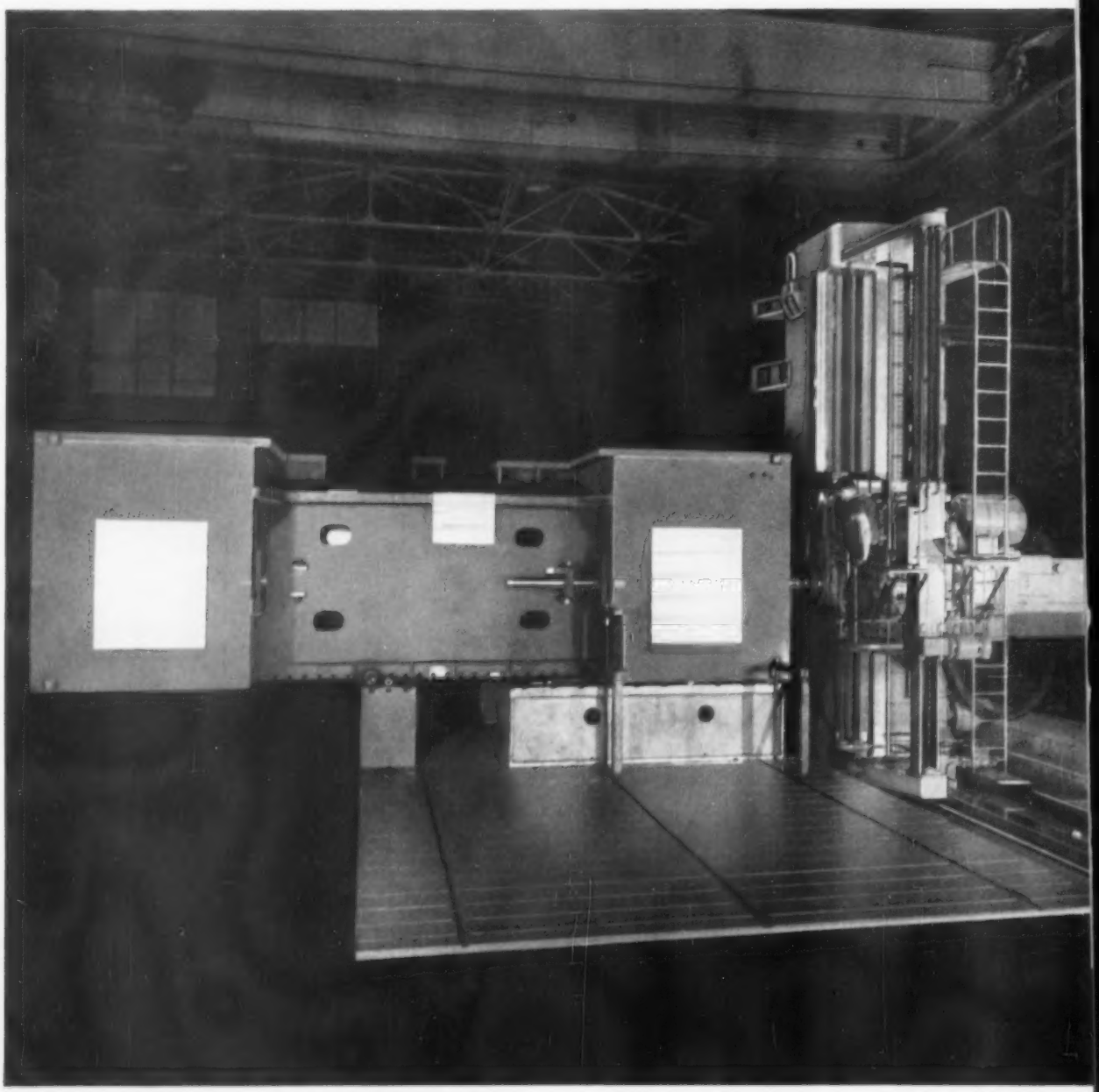
**...gives results like this:**

Finish grinding four diameters in one operation. Production is 380 shafts per hour. Stock removal .003". Work uniformity improved from .0007" to .0003" over former method. Cuts grinding and inspection costs.




LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

# Huge work-handling capacity . .



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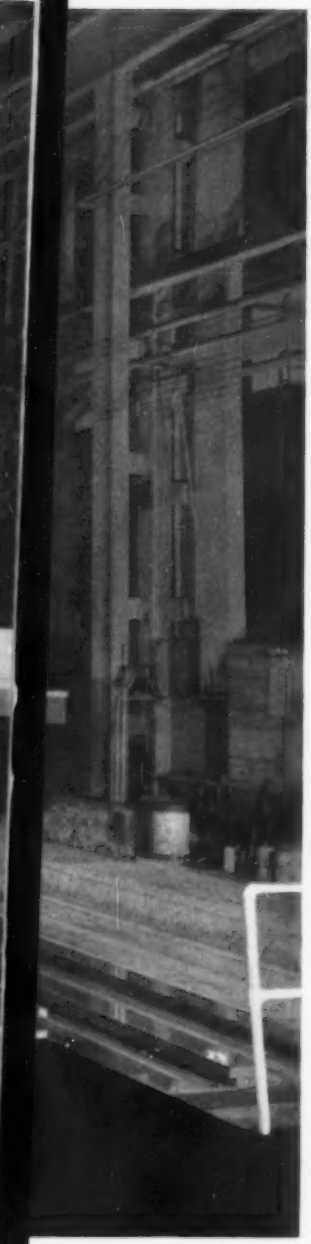
**GIDDINGS & LEWIS MACHINE TOOL CO.**
FOND DU LAC, WISCONSIN G-66

*Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Machines.*

# . . . that's Clearing's profit formula



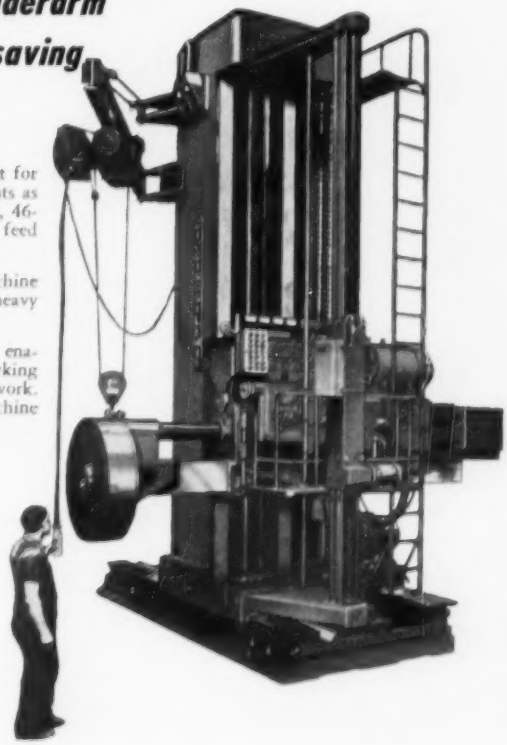
## 80-ton hydraulic press weldment machined on Giddings & Lewis Model 570-FUAR Horizontal Boring, Drilling and Milling Machine

A 166,000-pound giant, this Giddings & Lewis Model 570-FUAR Horizontal boring, drilling and milling machine with 7" diameter spindle underarm support and 75-hp spindle drive, is the *most powerful . . . most versatile* machine ever designed. It has the ability to maintain exact tolerances in machining huge castings or weldments at extended work ranges. Clearing Machine Corporation, division of U. S. Industries, Inc., Chicago, uses Model 570-FUAR to precision machine many of the weldments used in their power presses. In illustration at the left, Clearing is boring 18" diameter bearing holes with a feed rate of .025" per revolution at 12 rpm . . . mill-face the pads . . . and cut the tee slots on an 80-ton, 307" long x 114" wide hydraulic press bed weldment.

The machine underarm support assures maximum precision under heaviest cuts, even when performed at considerable distances from the headstock. Extended travel of both headstock and column provides additional machining versatility. For more information on G&L's 50 Series machines, see your nearest G&L representative, or write to factory.

### *All-new Model 570-FUAR with 7" diameter spindle and underarm support . . . featuring time-saving optional equipment*

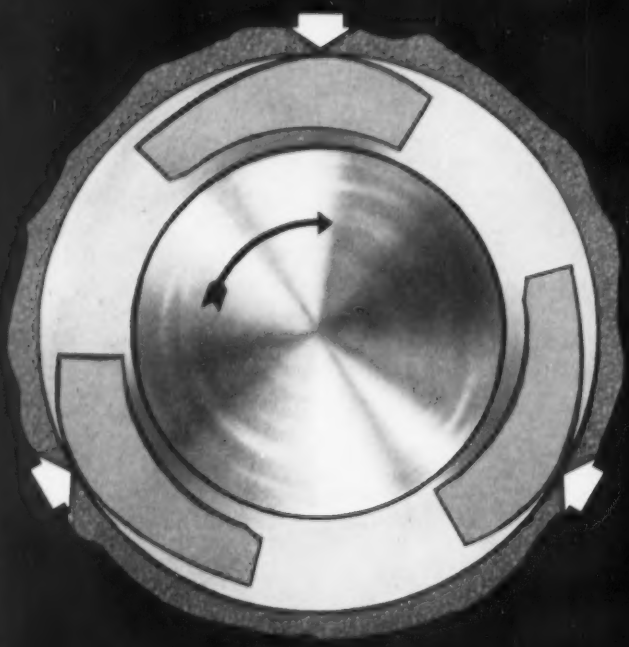
- 7-inch diameter spindle with underarm support for mounting such productive machining attachments as shaper-slotter head, angular milling attachment, 46-inch face plate drive and 48-inch continuous feed facing and boring head.
- Power hoist, mounted integrally with the machine column, facilitates handling and setting up of heavy accessories.
- Built-in elevator on machine's 21-foot column enables the operator to select the most ideal working position in relation to the headstock and work. Elevator operates independently of the machine headstock.



**Literature Available:**

For complete specifications on G&L 50 Series (floor-type) horizontal boring, drilling and milling machines, ask for Catalog No. 50-F.

# Unequaled Attendance Record



CINCINNATI FILMATIC grinding machines are symbolized here.

PLAIN GRINDING MACHINES

UNIVERSAL GRINDING MACHINES

ROLL GRINDING MACHINES

CINCINNATI

## OVER 18 YEARS, WITHOUT MISSING ONE SINGLE MINUTE OF THE WORKING DAY!

That's the amazing record of CINCINNATI® FILMATIC grinding wheel spindle bearings, a standard feature of Cincinnati centertype and centerless grinding machines. Some of these machines, built 18 or more years ago, are still running, and the grinding wheel spindle bearings have never once required adjustment or maintenance; have never once slowed down or stopped production.

Over 99% of FILMATIC spindle bearings — thousands of them — have compiled this highly desirable cost-reducing record for Cincinnati grinding machines in metalworking shops everywhere.

You can obtain the advantages of FILMATIC spindle bearings by installing Cincinnati precision grinding machines in your shop. Would you like to have more information about these bearings? Write for booklet "The X-Ray Story of FILMATIC Grinding Wheel Spindle Bearings," publication No. G-604, illustrated here. And if you're not familiar with current Cincinnati grinding machines, write for general catalog No. M-1961, or look in Sweet's Machine Tool Catalog.

**CINCINNATI GRINDERS INCORPORATED**
**CINCINNATI 9, OHIO**

The full story of CINCINNATI FILMATIC spindle bearings and how they can benefit your shop, is contained in this profusely illustrated booklet. Write for your copy. Ask for publication No. G-604.

# CINCINNATI

CENTERLESS GRINDING MACHINES

CHUCKING GRINDING MACHINES

MICRO-CENTRIC GRINDING MACHINES

CENTERLESS LAPPING MACHINES

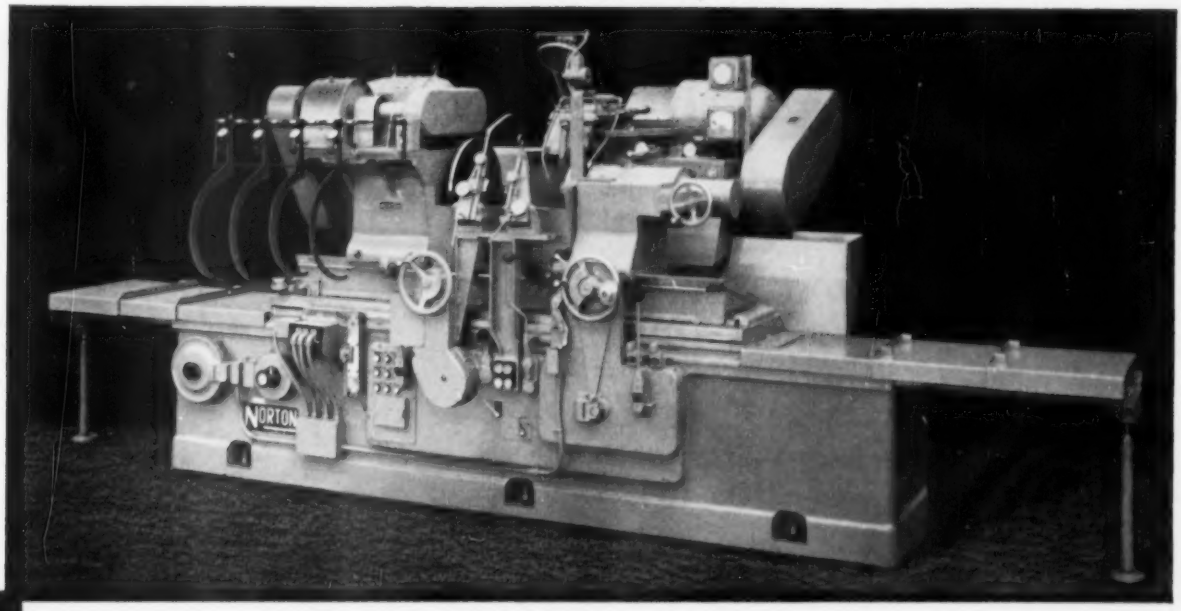
*Newest Norton Grinder!...*

# The 30" Type LCTU Semiautomatic...

*...a production-booster for grinding large-diameter parts...*

a profit-booster for YOU

**Every Feature For Fast, Accurate, Automatic Grinding** of large-diameter, relatively light parts is built into the new Norton 30" Type LCTU Semiautomatic Cylindrical Grinder. It gives you the "Touch of Gold" by adding value to the parts it grinds and by increasing your production rate and profit margin. All controls are within easy reach of the operator and special job-easing equipment reduces his work and increases your production. This ultra-modern grinder is available in work lengths of 48", 72" and 96".




The new Norton 30" Type LCTU Semiautomatic Cylindrical Grinder is expertly engineered to improve your grinding operations on ***large-diameter parts of relatively light weight.***

It does this by bringing you maximum speed, accuracy, operating ease and economy — typical Norton "Touch of Gold" advantages that mean top-quality, lowest cost production.

### *Advanced Features*

- Automatic grinding cycle, under one-lever control, assures fast, consistent output and reduces operating effort. Electrically timed termination of the cycle can be shifted to manual control.
- Start-stop of work rotation and coolant flow controlled automatically with the grinding cycle or manually, as desired.
- The rugged wheel spindle and sturdy work supporting units combine with the precision wheel feed mechanism to produce fast die-out with exceptional repetitive accuracy in sizing.
- Pre-set speed control permits separate table speeds for truing and grinding as set from the first workpiece. Thereafter, either speed is instantly provided by moving the table control lever.
- All controls for feeds and speeds easily accessible from front of machine. Automatic or manual wheel feed settings speeded by "click-count" index, enabling settings for work diameter reduction in increments as fine as .0001". Handy work jogging lever permits fractional rotation of the work for most convenient loading or inspection.

### *Many Accessories*

are available to increase the efficiency of the 30" Type LCTU for special jobs. Optional extras include locating devices, automatic wheel truing, automatic compensation of wheel head setting after truing and a lever-operated device for moving the grinding wheel into a shoulder to be ground.

### *To Meet Your Competition*

Obsolete grinding equipment is a business risk. Why not get all the facts on how the new, highly advanced 30" Type LCTU Grinder can aid in improving your competitive position? See your Norton Representative or write direct. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass.

*District Offices:*
Worcester • Hartford • Cleveland • Chicago • Detroit
*In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5

***To Economize, Modernize with NEW***

**NORTON**

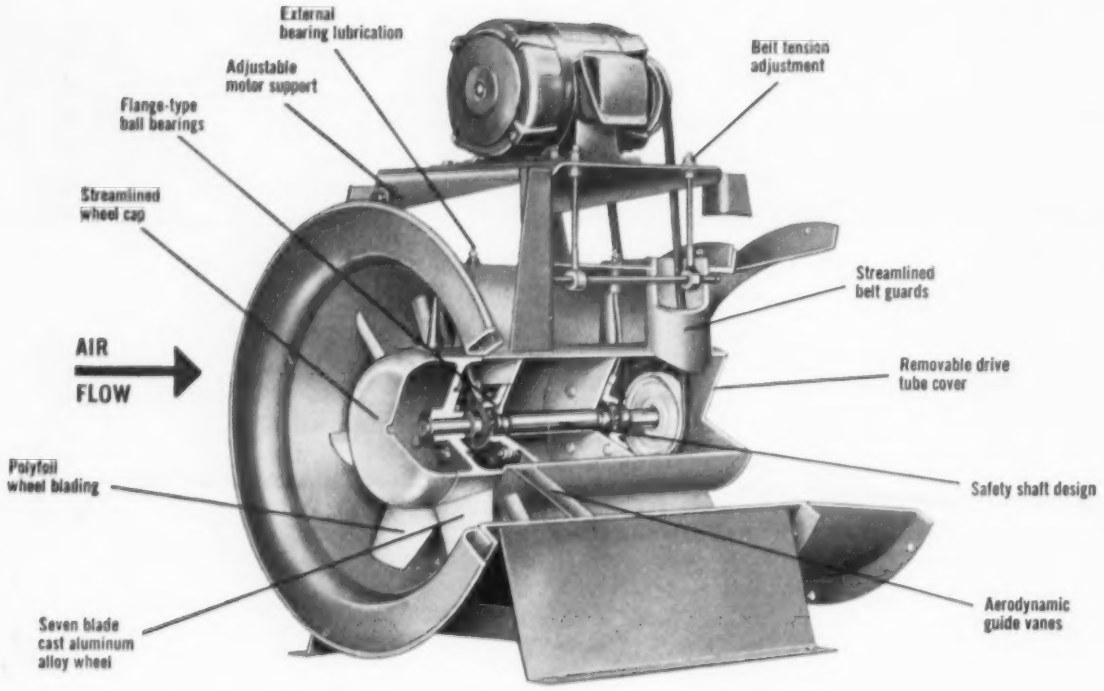
**GRINDERS and LAPPERS**

*Making better products . . . to make your products better*

**NORTON PRODUCTS:** Abrasives • Grinding Wheels
Grinding Machines • Refractories
**BEHR-MANNING PRODUCTS:** Coated Abrasives
Sharpening Stones • Behr-cat Tapes

# NEW Improved Westinghouse Axial Flow Fans

## *for Industrial air, fume, vapor handling jobs!*



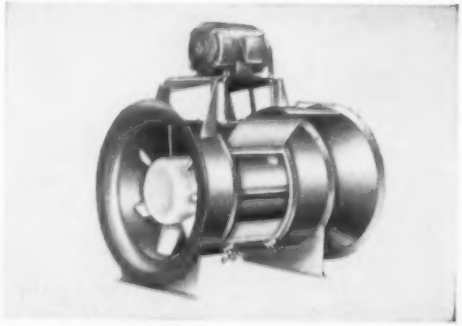

CUTAWAY VIEW OF WESTINGHOUSE AXIFLO® VANEAXIAL FAN FOR GENERAL APPLICATION.

### COMPLETE NEW LINE

**With:** volumes from 1,700 to 100,000 CFM—static pressures up to 3¼"—14 sizes, Vaneaxial or Tube Axial, direct-connected or V-belt driven, with wheel diameters from 15" to 72".

- **Space Saving** . . . compact Axial Flow design permits installation directly into duct work.
- **Improved performance** . . . non-overloading horsepower feature permits use of smaller motors.
- **Least maintenance** . . . rugged practical construction insures continuous trouble-free operation.

For complete application service, call your nearest Sturtevant Sales Engineer, or write Westinghouse Electric Corporation, Sturtevant Division, Dept. **26J**, Hyde Park, Boston 36, Mass.



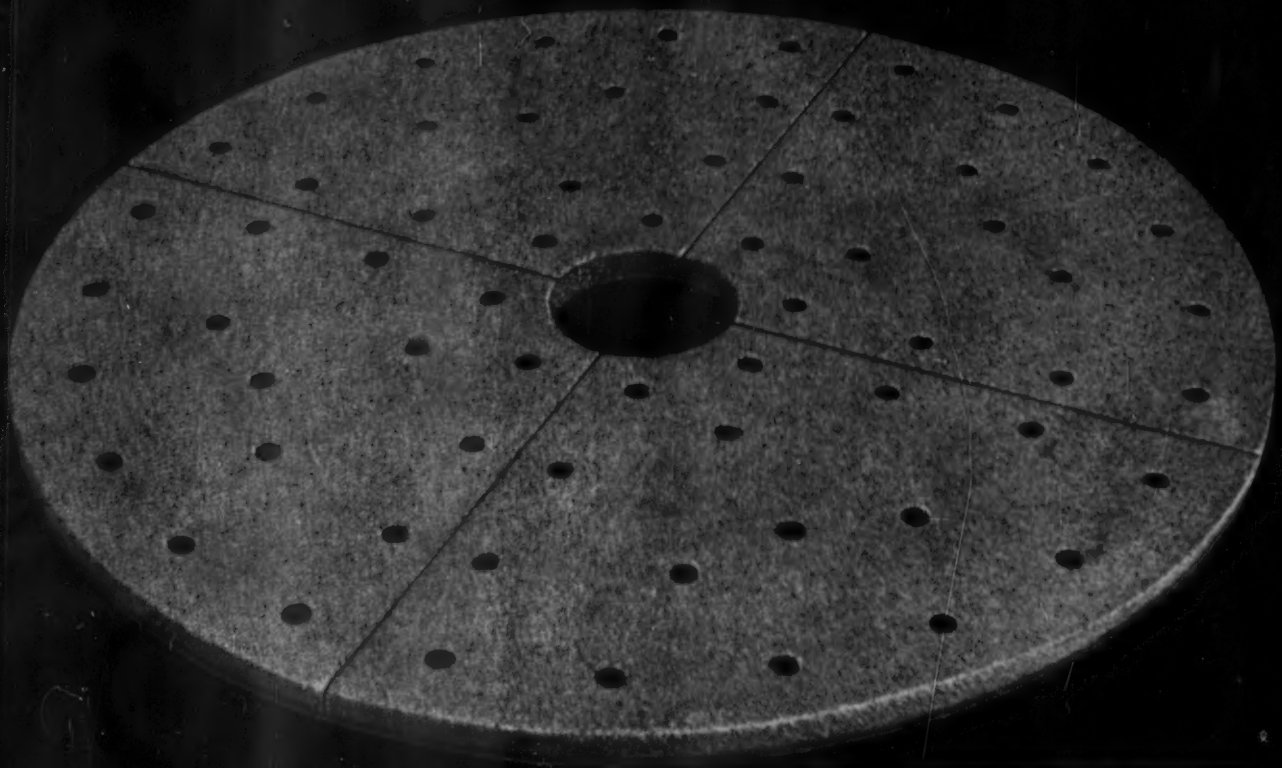
Spray booth Vaneaxial Fan specially designed to provide easy access required for paint spray exhaust!

# WATCH WESTINGHOUSE!

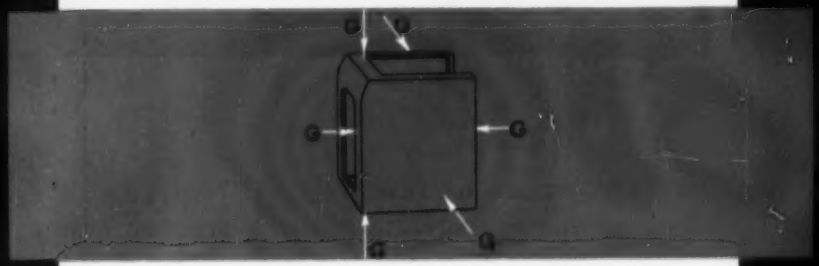
J-80092AA

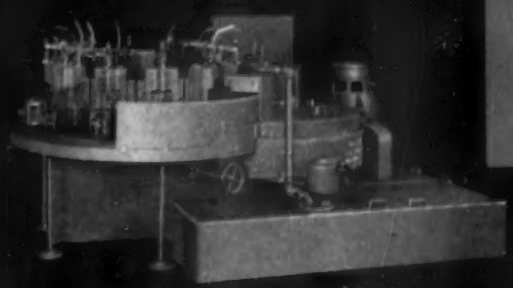
*COVER PRESIDENTIAL CAMPAIGNS ON CBS TELEVISION AND RADIO*

# How disc life was increased from 5 days to 5 weeks



This production improvement on coin box grinding results directly from combined recommendations of *both* Gardner Machine Representative and Gardner Abrasives Specialist . . .





*Gardner #124-53" horizontal disc grinder for continuous grinding of coin box surfaces.*

*Here's what was done:*

1. Disc specification revised
2. Dressing method changed
3. Minor adjustment in fixturing

*For practical solutions to your disc grinding problems call Gardner for complete service.*

# GARDNER

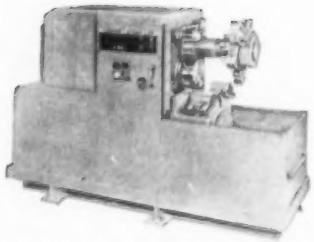
## abrasive discs

BELOIT, WISCONSIN

# WARNER & SWASEY 2 AC AUTOMATICS

## pay for themselves with one year's savings at Thew Shovel Company

Cost savings from 47% to 77%! That's the production record of two Warner & Swasey 2 AC Automatics on small and medium lot work at Thew Shovel Company, Lorain, Ohio. Annual dollar savings exceed the cost of both machines plus tooling! On small and medium lot work these automatics can undoubtedly return substantial savings for you. To discuss their application to your work, call in our Field Engineer.

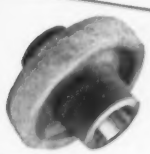


**1 AC CHUCKING MACHINE**
8" or 10" Chuck—6" Working Stroke

**2 AC CHUCKING MACHINE**
10" or 12" Chuck—9" Working Stroke

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

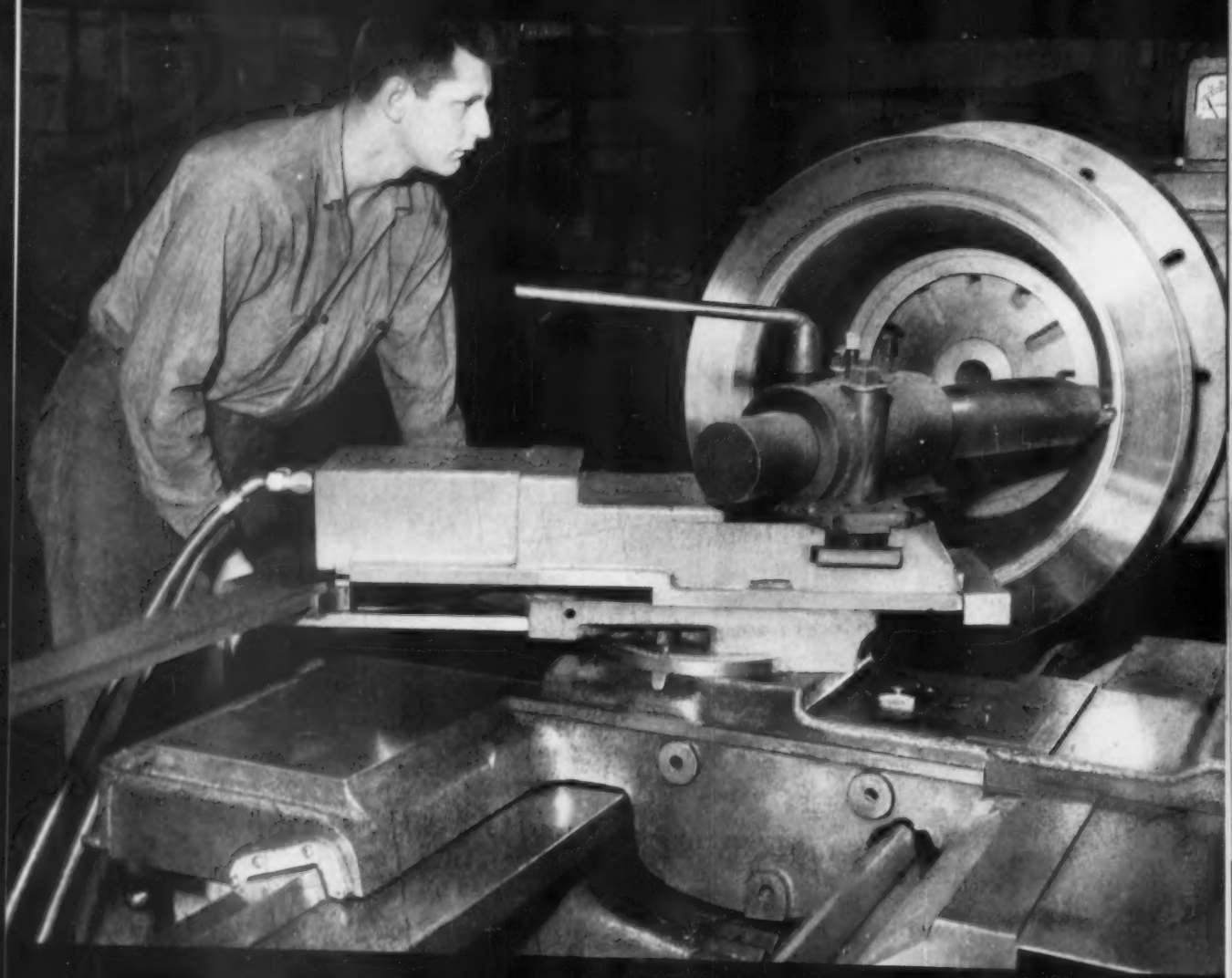
# PRODUCTION RECORD

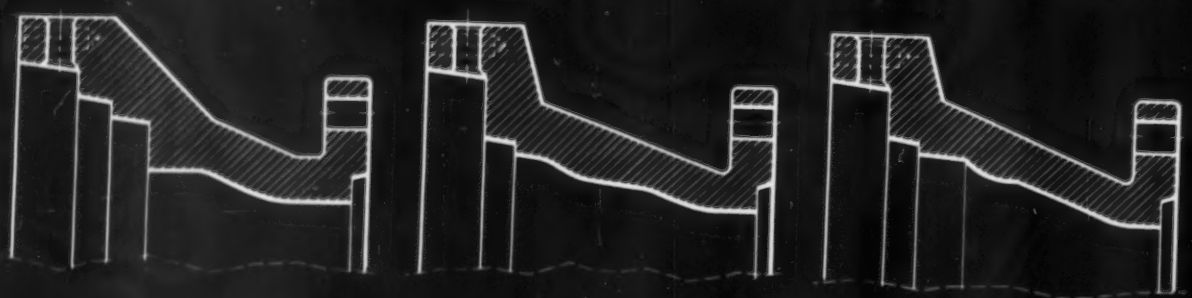
| PART | PART NAME | OLD TIME | NEW TIME | MONTHLY TURNOVER | % SAVINGS |
|---|---|---|---|---|---|
| | Pinion | .280 hours | .087 hours | 100 | 69.0% |
| | Roller | .392 hours | .087 hours | 2000 | 77.8% |
| | Sprocket | .376 hours | .177 hours | 175 | 52.4% |
| | Roller | .373 hours | .126 hours | 447 | 66.2% |
|  | Roller | .372 hours | .141 hours | 109 | 62.2% |
| | Spacer | .074 hours | .039 hours | 770 | 47.2% |
| | Box | .431 hours | .193 hours | 108 | 55.6% |
| | Box | .504 hours | .231 hours | 36 | 54.0% |

WARNER & SWASEY
*Cleveland*
PRECISION MACHINERY SINCE 1880

before you buy a tracing lathe,

find out how economically





you can . . .

# add HYDRA-TRACE* to your Present LeBlond

**American Cast Iron Pipe Co. did!** Now they have all the advantages of a "new" tracing lathe, at a fraction of new-lathe cost. Actually, Hydra-Trace Duplicating Attachment is quickly and easily installed on most any LeBlond Lathe built since 1935.

This tracing-boring job at American Cast Iron Pipe Co., Birmingham, Ala., is a good example of Hydra-Trace performance. Bells for centrifugal pipe molds are machined internally with Hydra-Trace feeding at 30° angle. The part is finished in one-third time required for hand-fed turning. Details of the machining operation were worked out by LeBlond engineers, who prepared prints and template pattern for American.

LeBlond offers a wide variety of useful turning attachments. Because of the inherent stamina of LeBlond machines, our customers often solve special turning problems by adding to their present machine—good for many more years of dependable service.

Perhaps you, as a LeBlond Lathe owner, have a tracing job made to order for Hydra-Trace. Our field engineers are always on call, ready to work with you in solving your specific turning problems. Write today and tell us your needs.

*Hydra-Trace (Trade Mark registered U.S. Pat. Off.) is LeBlond's heavy-duty hydraulic tracing attachment. Can be mounted in place of compound rest on practically all LeBlond lathes built since 1935.

**. . . cut with confidence**

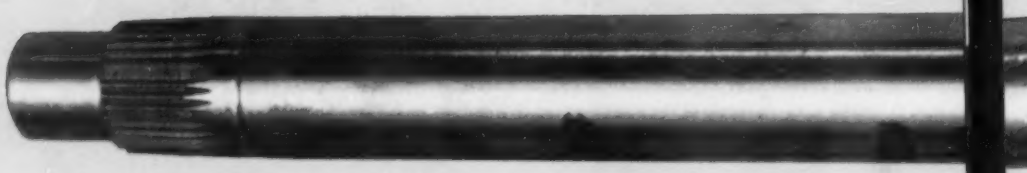
Simply adding HYDRA-TRACE made a tracing lathe of this five-year-old 32" LeBlond Heavy Duty—at small cost. These parts call for tracing-boring operation. Material #1025 steel; spindle speed 35 rpm; feed .016; carbide tool; finish 60 micro-inches; tolerance ±.0025. Machining time 3 hours, one-third time required for hand-fed turning.

LeBLOND of Cincinnati

**THE R. K. LEBLOND MACHINE TOOL COMPANY**
**CINCINNATI 8, OHIO**

*World's largest builder of a complete line of lathes for more than 69 years*

# it's just a simple T-slot



## but see how production jumped . . . on this steering sector shaft

## by converting to LAPOINTE -BROACHING

**Somebody gave this automotive manufacturer the right steer,** when the machining of this simple T-slot in a solid steel forging was switched to LAPOINTE-Broaching. Production jumped to 480 pieces per hour! (At 80% efficiency.) And this is accomplished by *one operator.*

**If you are making parts in quantity,** whether the parts are large or small, you should consider LAPOINTE-Broaching. One of our Field Engineers will gladly call on you, on request, and explain how *Lapointe takes the responsibility for the entire broaching program . . .* we design and build the broaching machines, design and build the broaching fixtures, design and make the broaches!

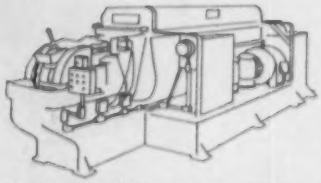
**THE LAPOINTE MACHINE TOOL COMPANY**

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

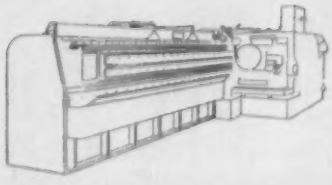
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

***Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE***

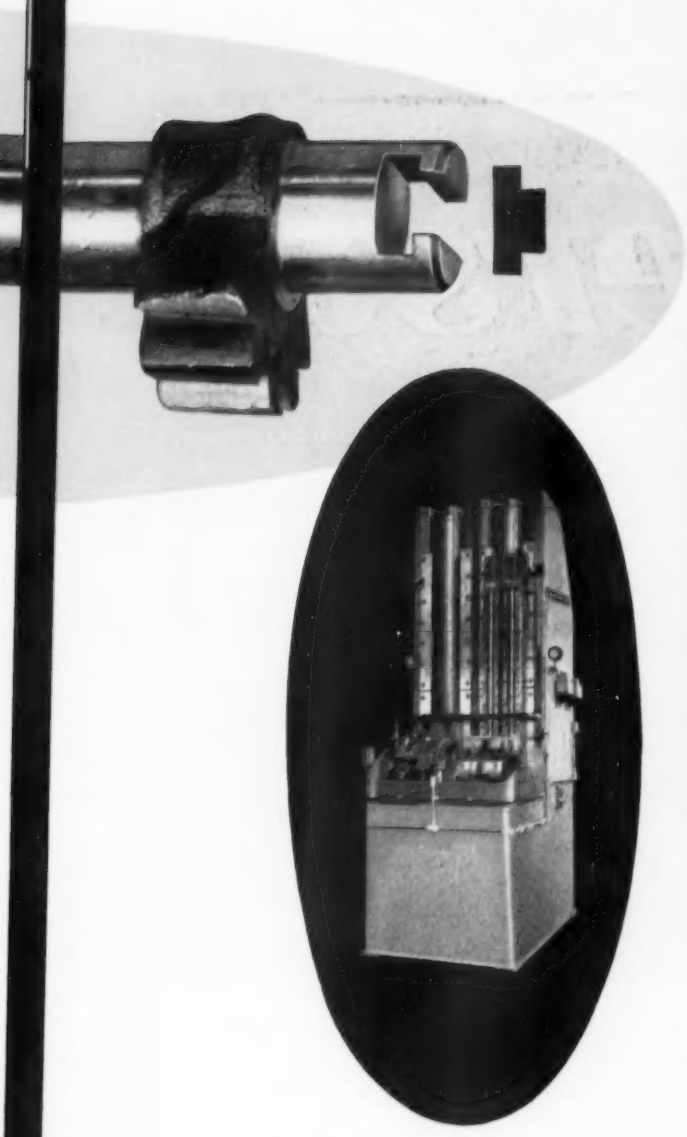
60" STROKE HORIZONTAL, ELECTRIC



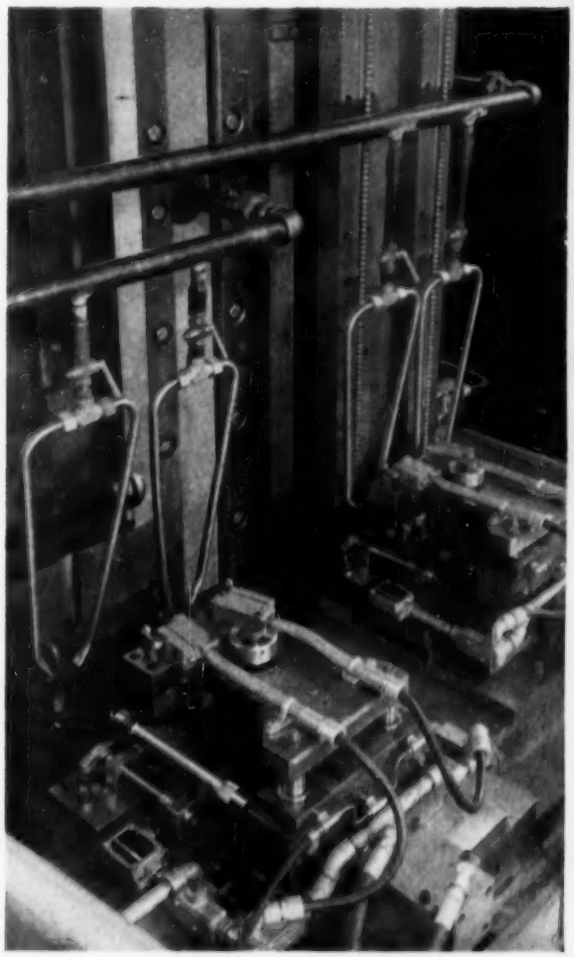
CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

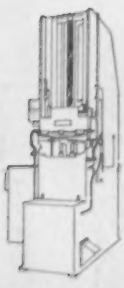


LAPOINTE 15-ton, 78-inch stroke
Double Ram Vertical Broaching Machine

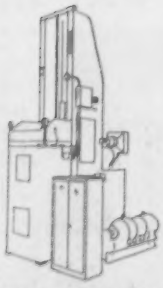


These Lapointe-designed-and-built fixtures have a foolproof safety switch to prevent cycling if parts are not properly located. Work is hand fed, hydraulically clamped. Coolant shuts off automatically at end of the broaching stroke, and goes on again at the beginning of the next stroke.

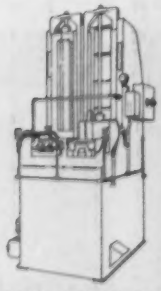
This type Lapointe machine is built rugged for close tolerance work and is extremely efficient, especially engineered for high-production surface broaching. It comes in a range of sizes: 3- to 25-ton capacity, 42- to 90-inch stroke. Variable speed. Equipped with the exclusive patented Lapointe Tip-Down Table or, optionally, with the Lapointe In-and-Out Table. Flexible, safe to operate. (Available in single ram, also.)



VUE-7 VERTICAL
PULL-UP ELECTRIC



SRVE SINGLE RAM
VERTICAL, ELECTRIC



DRVE DOUBLE RAM
VERTICAL, ELECTRIC

**LAPOINTE**

known to be the best in

**BROACHING**

## the latest word in low cost machining

# televersal

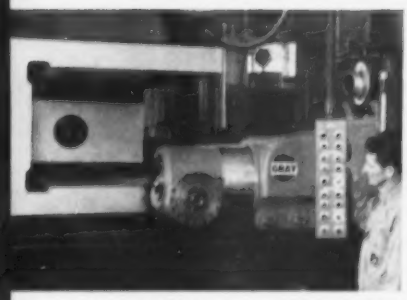
This new GRAY TELEVERSAL head tremendously increases machining range. Conveniently applied, quickly positioned, its great rigidity permits highest horsepower milling cuts.

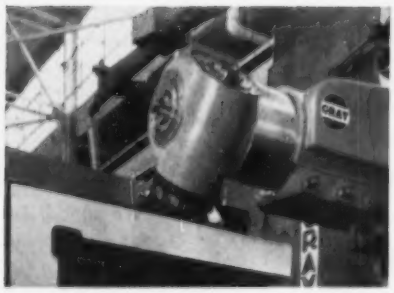
The large diameter quill may be swiveled to permit any angular cut. A triple-straddle clamp inflexibly locks the quill to the cast pyramid body.

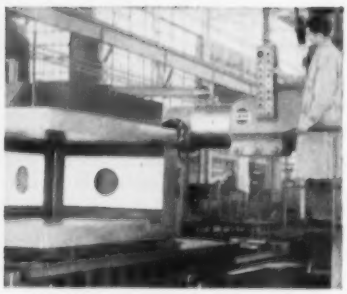
Designed to keep the job low and yet permit great machining range. Ideal when used with column cross travel of the new GRAY horizontal, boring, drilling and milling machine.

Not just an attachment, but a high power massively built, heavy milling unit that offers a new concept in versatility.

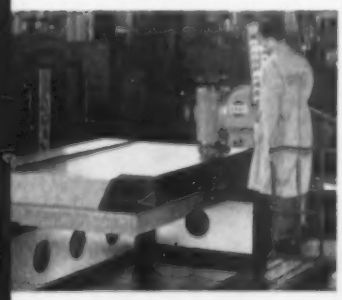
The G. A. GRAY Co., Cincinnati, Ohio

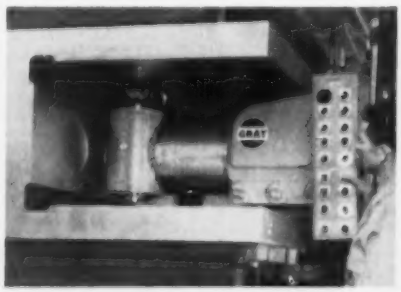


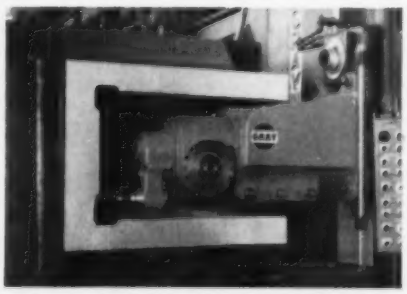




**six different surfaces and more ... and only ONE work-setting**

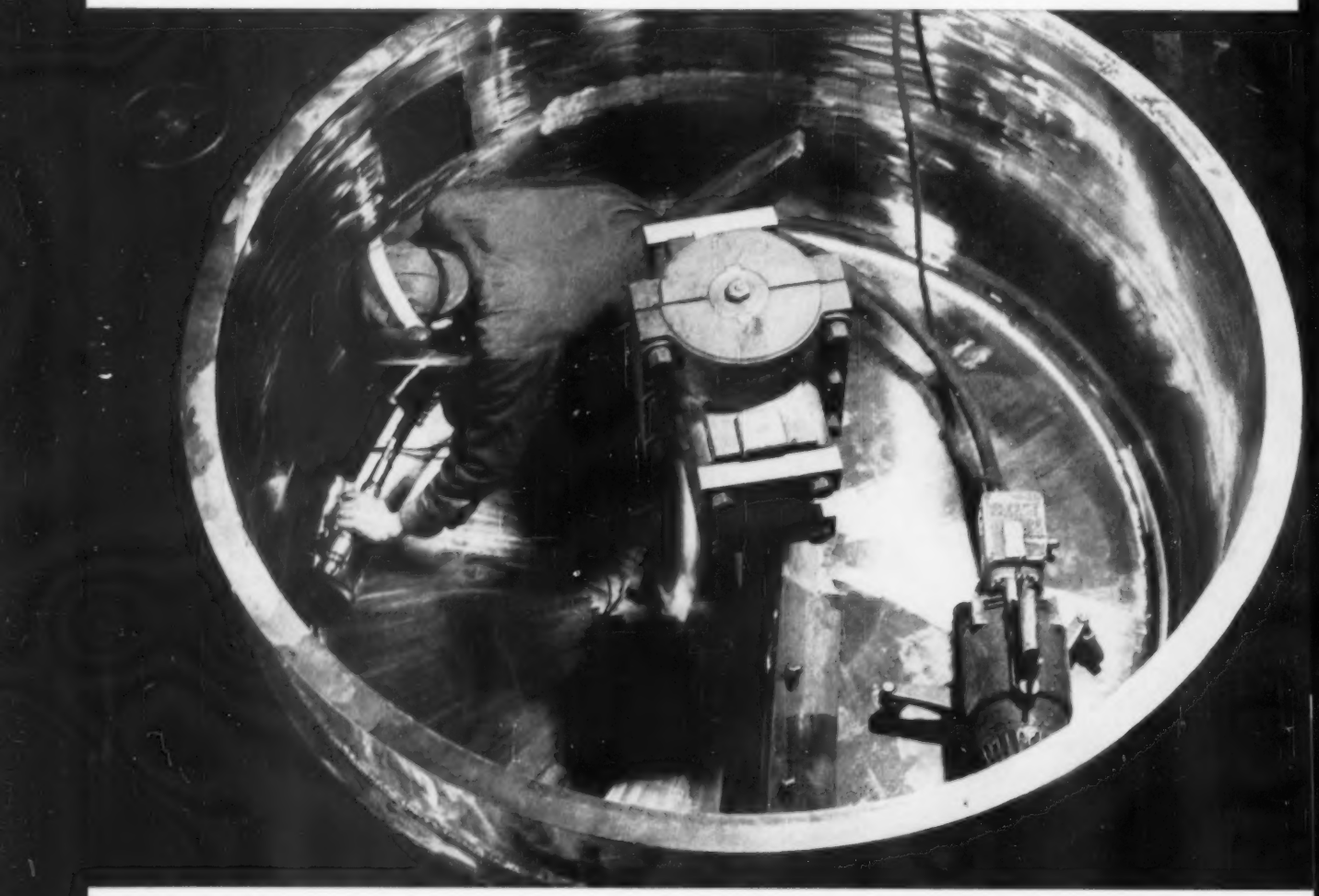






GRAY
GRAY
GRAY

*Stainless Steel grinding and polishing information:*



# go slow...keep temperatures low


UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
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USS

## USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

If you keep Stainless Steel's physical characteristics in mind, you should never have grinding and polishing troubles. Remember these four points:

**1.** Stainless Steel has low heat conductivity and a high coefficient of expansion. Therefore, keep work as cool as possible. To avoid hot spots, heat tinting and local distortion such as buckling, keep temperatures low. Don't sacrifice surface for time by increasing wheel pressure. For coarse grinding, use wheel speeds of 5000-6000 linear feet per minute. For finer grinding, you can go up to 7000.

**2.** Stainless Steel is hard and abrasion-resistant. To further avoid overheating, use coolants or lubricants when practicable.

**3.** Avoid dwelling on any one spot or area. Grind continuously, returning to regrind when the surface has cooled.

**4.** Never use abrasives too fine for the job. Start with a coarse abrasive and go to successively finer grits. Remember that a fine grit removes more stock when the surface has been roughened by coarse grinding.

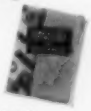
Stainless Steel surface finishing and protection is thoroughly covered in our Stainless Steel "Fabrication" book. For your free copy, write on your company letterhead to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

*You can spot productive hands by the company they keep!*

# Precision gets a boost with INDIA® and HARD ARKANSAS* oilstone files

When hand stoning tools, dies and parts, these Oilstone Files assure fast, easy, close tolerance cuts no matter how intricate the surface. INDIA for regular work, HARD ARKANSAS for superfine finishes. Available in 35 shapes and 97 sizes.

Hand Stoning Handbook — contains description of complete BEHR-MANNING Oilstone line. Address Behr-Manning, Troy, N. Y., Dept. AM-9.



In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

018

* *Trade-mark*

*India Oilstone File deburrs teeth on Reduction Drive Gears.*

*Mushroom Sanding Pad and Disc — shaped for contour polishing.*

*Metalite Belts for superior finishes, faster production.*

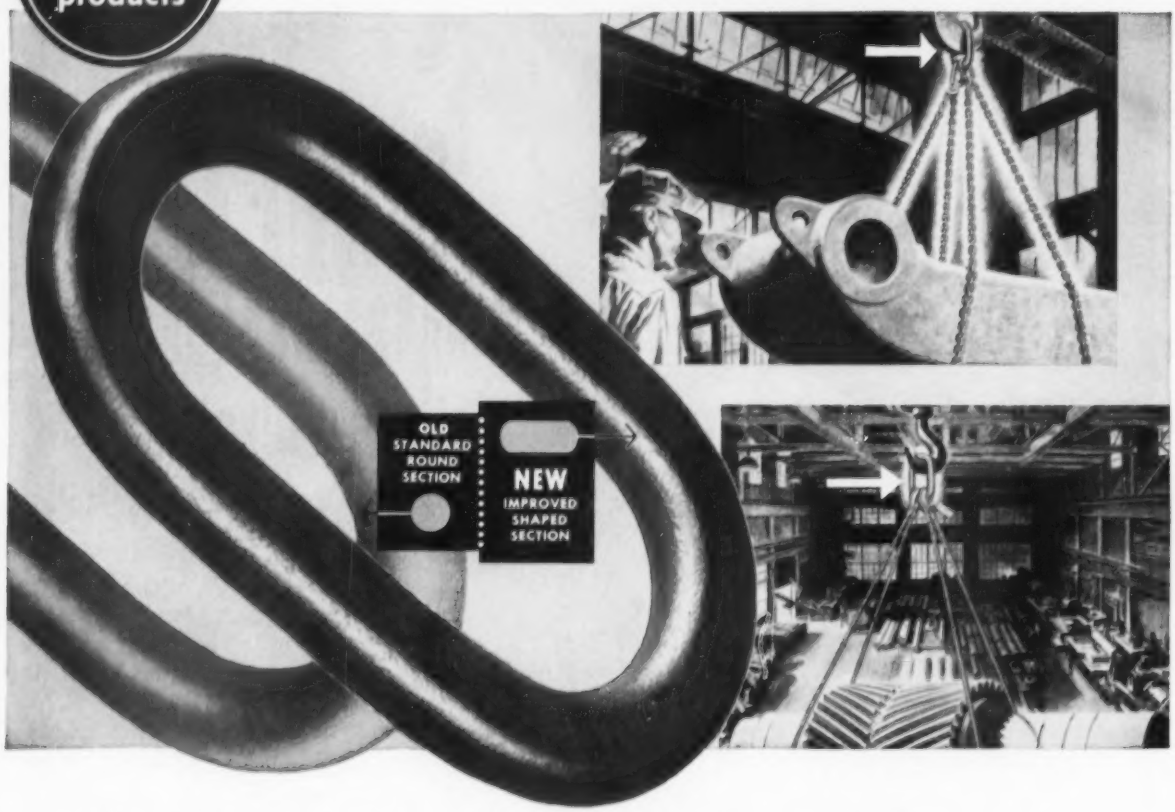
BEHR-MANNING Co.

® A DIVISION OF NORTON ABRASIVES

ACCO products

# ACCO Registered* Slings–Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY




## New Master Link for Slings—Either Chain or Wire Rope—Holds Its Form Under Loads Up to 18% Greater

• Latest product of the continuing research behind ACCO *Registered* Slings is this new Shaped Section Master Link. ACCO's engineers found that by shaping the link—as shown above—they could give it more "dimensional stability"—a better "section modulus." Translated into layman's English this means that the new shaped link, without any increase in weight, will withstand deformation under loads up to 18% greater than a standard round section link will.

Just as shaping a quantity of metal into a structural I-Beam allows it to handle greater loads than it could as a solid beam, so does ACCO's Shaped Section Master Link give better performance under greater loads than a link with a round section.

The new shaped link is smoother and provides a greater factor of safety. It is a better and safer link. It costs us more to make. But it will be offered on all ACCO *Registered* Slings—both wire rope and chain—at no increase in price.

### AN EXTRA BONUS OF SAFETY

This latest technological advance adds an extra bonus of safety to ACCO *Registered* Slings.

Each component of an ACCO *Registered* Sling is made from the best materials procurable for its use. Each part must prove to have strength equal to or greater than the sling body. All hooks for ACCO *Registered* Slings are Magnaflux tested. Then these components are assembled into slings according to carefully engineered designs that have proved themselves in rigorous field tests.

The completed sling is then individually proof-tested to twice the working load limit. Then and only then, is it awarded the coveted ACCO Registration Certificate and the identifying ring or tag.

### SEE YOUR DISTRIBUTOR

ACCO *Registered* Slings are readily available from a distributor near you. If you don't know him write to our Bridgeport office for his name.

*Trade Mark Registered

ACCO

AMERICAN CHAIN & CABLE

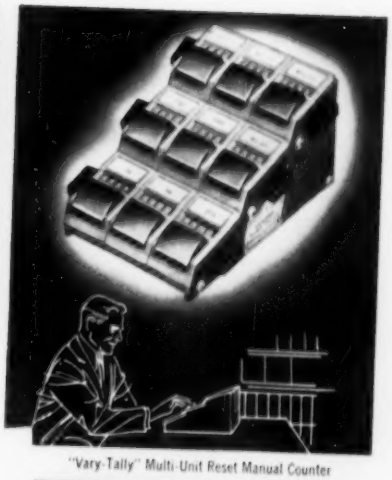
BRIDGEPORT, CONN.

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

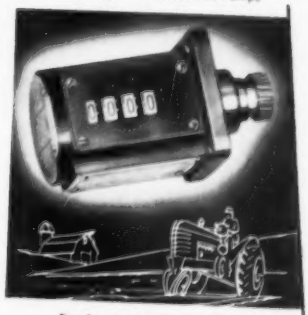
Better Value

Computing Head for Gasoline Pumps

"Master Meter Duplicator" prints receipts for fuel oil delivered from trucks



"Vary-Tally" Multi-Unit Reset Manual Counter

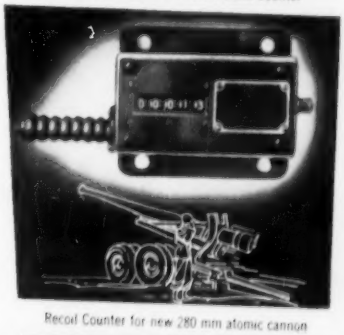


Rev-Counter for all types of engines

# Everyone Can Count on VEEDER-ROOT

Everywhere you look in everyday life, you see a familiar face . . . the face of a Veeder-Root Counter or Computer. From gasoline pumps to fuel oil trucks to textile mills . . . in the home, on the farm, in business and commerce, in modern automated industry . . . Veeder-Root standard and special devices are keeping everything under *Count*rol . . . manually, mechanically, electrically. And the mathematical probabilities are mighty high that *you* can count on Veeder-Root, too . . . to your advantage and profit. Why not let us figure out how, *right now*?

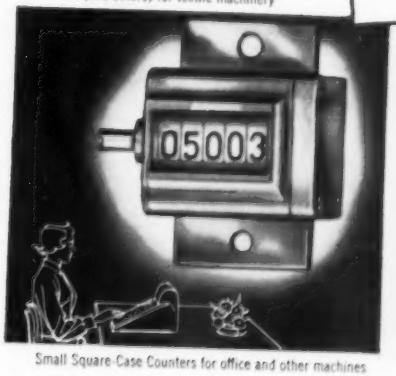
**VEEDER-ROOT INC. • HARTFORD 2, CONN.**



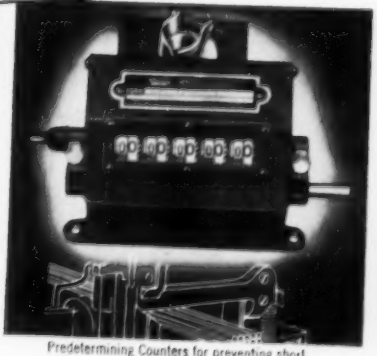
Recoil Counter for new 280 mm atomic cannon

2-3-4 Convertible Counters (and others) for textile machinery

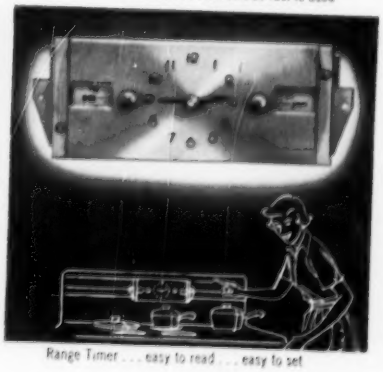
Fuel-Remaining Counter for aircraft . . . subtracts as fuel is used




Small Square-Case Counters for office and other machines



Predetermining Counters for preventing short and over-runs on production machines



Range Timer . . . easy to read . . . easy to set

STOCKS OF STANDARD COUNTERS AVAILABLE AT — Greenville, S. C. • Chicago 6, Ill. • New York 19, N. Y. • Los Angeles • San Francisco
Montreal 2, Canada • Offices and Agents in Other Principal Cities

# "Tomorrow's materials

***Norton electric furnace products meet today's needs . . . will meet tomorrow's needs . . . for ever higher temperature applications.***

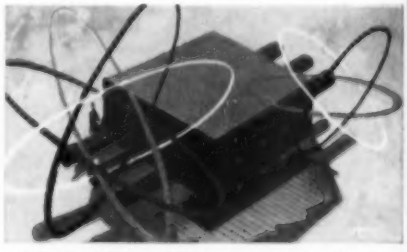
Space travel will some day be a reality.

But first, new materials must be developed. Electrochemically refined materials that will endure higher temperatures, for longer periods of time, than any now commercially available. Materials, also, that will withstand conditions as yet unknown.

As the world's largest manufacturer of abrasives, Norton has long pioneered in electric furnace techniques. This has resulted in grinding wheels, abrasive grains and other abrasive products of exceptional strength, hardness and efficiency. It has also led to the development of new electrochemically refined materials to meet

**Where New Materials Are Born.** In Norton electric furnaces, abrasives and other materials with combinations of qualities and characteristics not found in natural substances are evolved.

**Rocket Nozzles** are used only once. But during this brief service these Norton nozzles withstand a concentrated, far more destructive attack than most industrial materials encounter in years of use.



**NORBIDE® Control Rods** for reactor piles are Norton-processed from boron carbide. The hardest material made by man for commercial use, NORBIDE boron carbide has many other applications.

Making better products...

# *will be found...*"

industry's constantly increasing needs.

Another result is that Norton now supplies a wide range of products for high-temperature applications, including rocket and jet plane propulsion, thermal barriers and atomic energy equipment.

The search for tomorrow's materials is a constant, daily job in Norton laboratories. Behind this project are the research, engineering and manufacturing resources of a world-wide organization. The materials will be found.

NORTON
ABRASIVES

**First In Abrasives.** Abrasives — in particular, Norton grinding wheels and Behr-Manning coated abrasives — are Norton's principal products. Norton also manufactures the most complete line of precision grinding machines and a broad line of refractory materials, including products for the AEC.

## Across the world and still expanding

**Abrasive and Grinding Wheel Plants** — Worcester, Mass.; Santa Clara, Calif.; Hamilton, Ontario; South Africa; England; France; Germany; Italy. **Behr-Manning Plants** — *Coated Abrasives and Behr-cat Tapes* — Troy, N. Y.; Canada; Australia; France; Northern Ireland; Argentina. **Electric Furnace Plants** — Huntsville, Alabama; Chippawa, Ontario; Cap-de-la-Madeleine, Quebec. **Grinding and Lapping Machine Plant** — Worcester, Mass. **Refractories and Electro-Products Plant** — Worcester, Mass. **Norton Pike Plant** — *Sharpening Stones* — Littleton, New Hampshire. **Bauxite Mines** — Bauxite, Arkansas.

*Main Office*: Norton Company, Worcester, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

to make your products better

# ARMSTRONG

The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

*Write for catalog*

## Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

**ARMSTRONG TOOL HOLDERS** reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

**ARMSTRONG TOOL HOLDERS** reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

**ARMSTRONG TOOL HOLDERS** permit increased speeds and feeds—produce more pieces per hour per machine tool.

**ARMSTRONG TOOL HOLDERS** are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

**ARMSTRONG TOOL HOLDERS** are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

Buy **ARMSTRONG TOOLS** from your Industrial Distributor

**ARMSTRONG BROS. TOOL CO.** *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

there's a

# CLEVELAND

## Single Spindle Automatic *exactly right* for your turning and forming work

The Cleveland Automatics briefly described at left combine an extremely wide range of multiple-tooled operations with quick set-up and simplified control. Four models in 16 capacities, make it possible for you to select a Cleveland *exactly suited* to your production requirements. Typical work performed by these Clevelands is shown below.

**TYPICAL PARTS PRODUCED BY MODEL AB, AW or A CLEVELANDS**

**TYPICAL PARTS PRODUCED BY MODEL B CLEVELAND**

Whichever Cleveland you select, you'll obtain a modern machine tool that will give you fast, accurate, economical production on long or short runs. You'll also be taking advantage of 65 years of experience in precision engineering, plus Cleveland's matchless reputation for reliability and service.

Investigate the many advantages of Cleveland Automatics for your production. Call in a Cleveland sales engineer or let us submit recommendations with production and cost estimates based on part samples or prints of your work. There is no obligation.

*For detailed descriptions of these Cleveland Automatics, write for new General Bulletin.*

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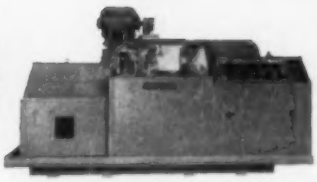
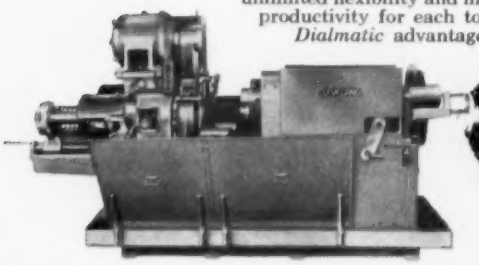
**MODEL AB DIALMATIC**



**MAX. CAPACITIES:**
1⅜" 3"
1⅝" 4¼"
2½" 5¾"

The most modern automatic available today. Equipped with Electronic Feed Drive. Turret tool feeds are infinitely adjustable, set by control panel dials. On 1⅜" and 1⅝" sizes, turret feeds *and* spindle speeds are electronically controlled. The 2½" and 3" AB can be quickly converted to a chucker. Ease and rapidity of set-up, unlimited flexibility and maximum productivity for each tool are *Dialmatic* advantages.

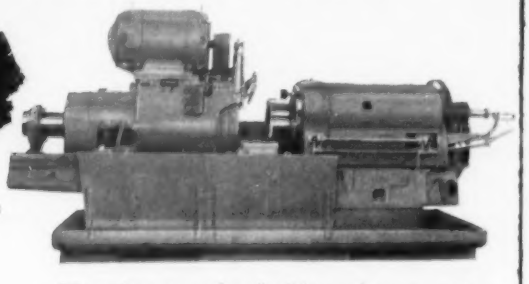
**MODEL AW**



**MAX. CAPACITIES:**
2½"
4¼"
5¾"

Differs from Model AB design only in that variable turret tool feeds are obtained through an improved mechanical drive. These are high-speed, accurate, rugged machines, quickly set up, easily operated. Their simplified mechanical design assures the user the utmost in freedom from downtime.

**MODEL A**



**MAX. CAPACITIES:**
1¼"
8"

More than seven hundred in use have proved Clevelands time-tested *universal camming*. No special cams required to perform any work within the capacity of the machine.

**MODEL B**

**MAX. CAPACITIES:**
1½"
2½"

**MODEL B-18**

**MAX. CAPACITIES:**
1¼"
1½"
2½"

Model B's do not have tool turrets. Tooling is mounted on a milling slide capable of turning several OD in one operation, plus one end working operation, and on two cross slides where forming and additional turning can be performed. Ideal for work involving multiple diameters, shoulders, chamfers, tapers, etc. Model B-18" handles work up to 18" long. A 24" machine is also available.

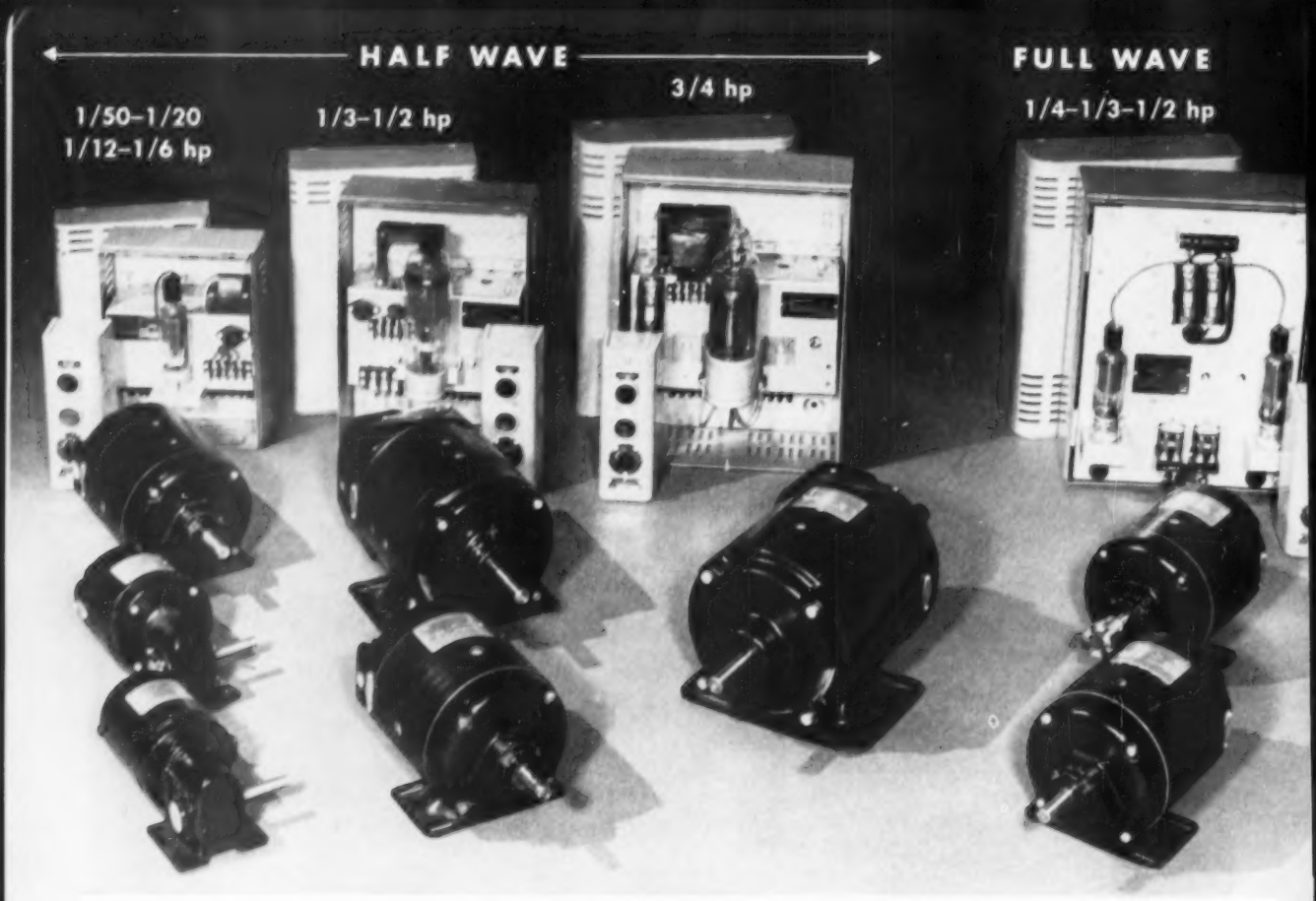
---

## THE CLEVELAND AUTOMATIC MACHINE COMPANY

**4928 Beech Street**
**Cincinnati 12, Ohio**

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

**Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines**




**A DRIVE TAILORED TO EVERY JOB** is the achievement of General Electric engineers who designed the new fhp Thymotrol drive line. Here are examples of this versatility:

**Three panel sizes** now cover the fhp range, making smaller ratings more compact, more economical than ever before.

**Full range of ratings**

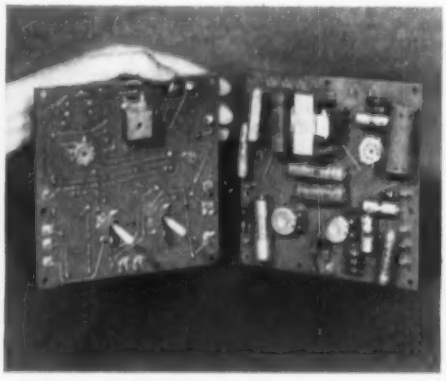
- Horsepower: 1/50 to ¾†
- Power supply: 220 v a-c, 50/60 cycles
- Speed range: 20 to 1
- Speed reg.
  (NL to FL): half-wave — 3%, full-wave—5% (adjustable to flat at any specific speed)

†Plus a full line of integral-hp drives.

**Building-block design**—you get the exact performance you want by selecting any combination of these optional features:

- Reversing operation
- Jogging (pre-set or run)
- Dynamic braking
- Tachometer follower
- Overload relay protection
- Tube warm-up protection

**ONE-TUBE DESIGN** of G-E half-wave Thymotrol drives minimizes tube maintenance. This type drive is suitable for most adjustable-speed jobs.



**PRINTED CIRCUITRY, DIP SOLDERING** are effective techniques which permit new lower General Electric prices. Exhaustive tests prove the sturdiness of this construction for industrial use.

**PLUG-IN PANEL BOARD** can be quickly removed for maintenance or replacement to minimize downtime—a must on such jobs as production conveyors.

***GENERAL ELECTRIC ANNOUNCES . . .***

# NEW full line of fractional-horsepower G-E Thymotrol* adjustable-speed drives—more compact, more rugged, more reliable, easier and more economical to maintain, yet priced up to 18% below previous models

General Electric announces a completely re-designed line of fractional-hp Thymotrol adjustable-speed drives—***designed to save you up to 18% over prices of previous models.*** These versatile new drives are applicable to conveyors, machine tools, in fact, to almost every small machine whose performance can be improved by adjustable speed.

### SELECT JUST THE DRIVE YOU NEED —AND SAVE MONEY!

Biggest cost-saving for you with new G-E Thymotrol drives is that you buy only as much drive as you need. For some applications, you'll want only the basic half-wave drive: motor, simple one-tube control, and control station. For more complex jobs, you can select any combination of seven different optional accessories to provide desired performance. To further match drive to job, these popular half-wave drives come in three panel sizes.

For rapid acceleration of high-inertia loads, for extra-smooth performance, or for flat speed-regulation adjustment, you'll want the new full-wave Thymotrol drive, with still other optional features.

### NEW DESIGN IS SIMPLE, RELIABLE

In designing new G-E Thymotrol drives for mass production, G-E engineers have also included many new features for longer life, lower operating costs, increased reliability:

**Plug-in panel boards** on half-wave units can be quickly removed without disturbing customer wiring for fast inspection, repair, or replacement, minimizing downtime.

**Printed circuitry and dip soldering** result in more compact units which simplify your design problems. Shock and vibration tests show this construction really stands up in industrial use. Parts replacement is simple using soldering iron and pliers.

**20:1 speed range** is now standard on all ratings. And operator can turn machine to full "off" with speed-control knob.

**High tube reliability**—all tubes on G-E Thymotrol drives are fully guaranteed for one year, usually last far longer.

### SIMPLE PACKAGED DRIVES OR ENGINEERED MULTI-MOTOR SYSTEMS

Whatever your adjustable-speed needs, from packaged single-motor drives to specially engineered multi-motor systems, you'll find the answer —*at new low prices*—at General Electric. See your G-E Apparatus Sales representative today. Or write for Bulletin GEA-6519 to Sect. 791-3, General Electric Co., Schenectady 5, N. Y.

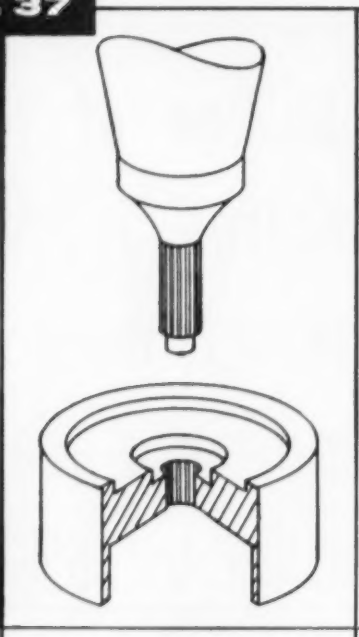
*Trade-mark of General Electric Co.

*Progress Is Our Most Important Product*

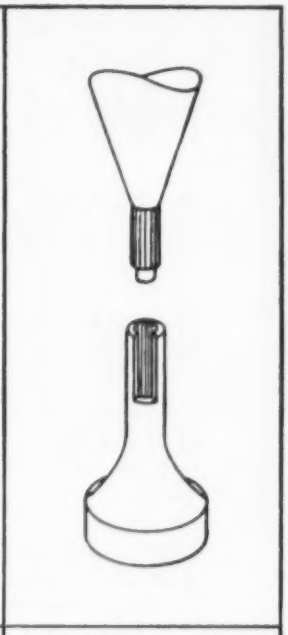
**GENERAL ELECTRIC**

## R. I. G. Case History No. 37

Tool steel punch and die set used for blanking small brass gears



Tool and hardened die plate cutaway



Tool used to produce internal spline and cutaway of spline

# PRODUCTION TIME SLASHED FROM 42 TO 4 HOURS WITH RAYTHEON IMPACT GRINDER

The conventional way of manufacturing this punch and die set requires making and hardening a precise punch; shearing the die to the punch and then hardening the die. The internal spline in the punch is made by broaching. These are difficult, time-consuming and costly operations. Because the die must be hardened after it is made, it may be distorted in heat treatment. Total time for this process is 42 hours.

### *CHECK THESE FEATURES*

- Machines hardened steel, titanium carbide, tungsten carbide—many other hard and brittle materials
- Forms intricate carbide dies without sectioning
- Cuts to 0.0002"—finishes to 8 microinches
- No heating of material or distortion of grain structure

### HOW THE R.I.G. DOES IT

The die plate, 5/16" thick with a 1/4" diameter center hole, is hardened *before* it is machined by the Impact Grinder. A tool which is .005" undersize on all dimensions with a pilot 1/16" long to fit the 1/4" hole is used to produce the rough pinion shape. Grit abrasive – #400 – is employed and cutting time is 16 minutes. A finished tool .0004" undersize on all dimensions makes the finished shape in four minutes, using #800 grit abrasive. The same procedure produces the internal spline shape to a depth of 3/16" in the punch in a total of 11 minutes.

### TOTAL CUTTING TIME 31 MINUTES

The entire job is completed in only four hours—including set up, changing tools and the actual cutting operations. The finished die is within .0002" of the required dimensions and surface finish is between 8 and 10 microinches. There is no distortion due to heat treatment. *Total time saved is 38 hours!*

Raytheon Impact Grinder for Ultrasonic Machining

### APPLICATION ENGINEERING FOR YOUR PROBLEM

Perhaps you have a difficult problem of machining hard or brittle materials which can be solved with the Raytheon Impact Grinder. Write Dept. 6120 and our Application Engineering Service will be happy to assist you. For further information, please request catalog No. 2-332, Dept. 6120.

*Excellence in Electronics*

RAYTHEON

A-2013

**RAYTHEON MANUFACTURING COMPANY**

**Equipment Marketing Department, Waltham 54, Mass.**

PRECISION WELDING SYSTEMS • IMPACT GRINDERS • ELECTRONIC MACHINE TOOL CONTROLS

**See Raytheon's Exhibit at Booth 2848 National Metal Exposition & Congress, Cleveland**

# 250-TON FORGINGS

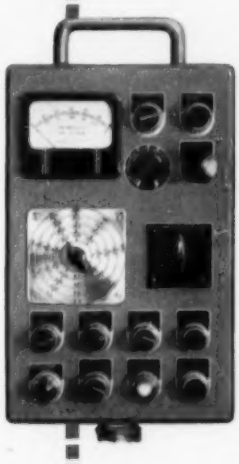
## *machined with finger-tip control*

Handles 250-ton forgings on centers alone while spotting for steadyrests. Swings 12 feet over the ways and takes work up to 60 feet long. Turns 14-foot tapers in one setting (with special attachment). That's the kind of performance delivered by this Betts 12-foot heavy-duty lathe.

Weighing over 240 tons, it is the heaviest, most powerful general-purpose lathe in the country. And it couldn't be easier to operate. A push-button panel mounted on the carriage enables the operator to control cutting speed with his eyes on the cut. He can change speed up or down while the tool is cutting – for maximum metal removal or optimum finish. Two big dials above the faceplate guide him, one indicating RPM, the other percentage of motor load. Exact settings are achieved faster and with greater ease than ever before.

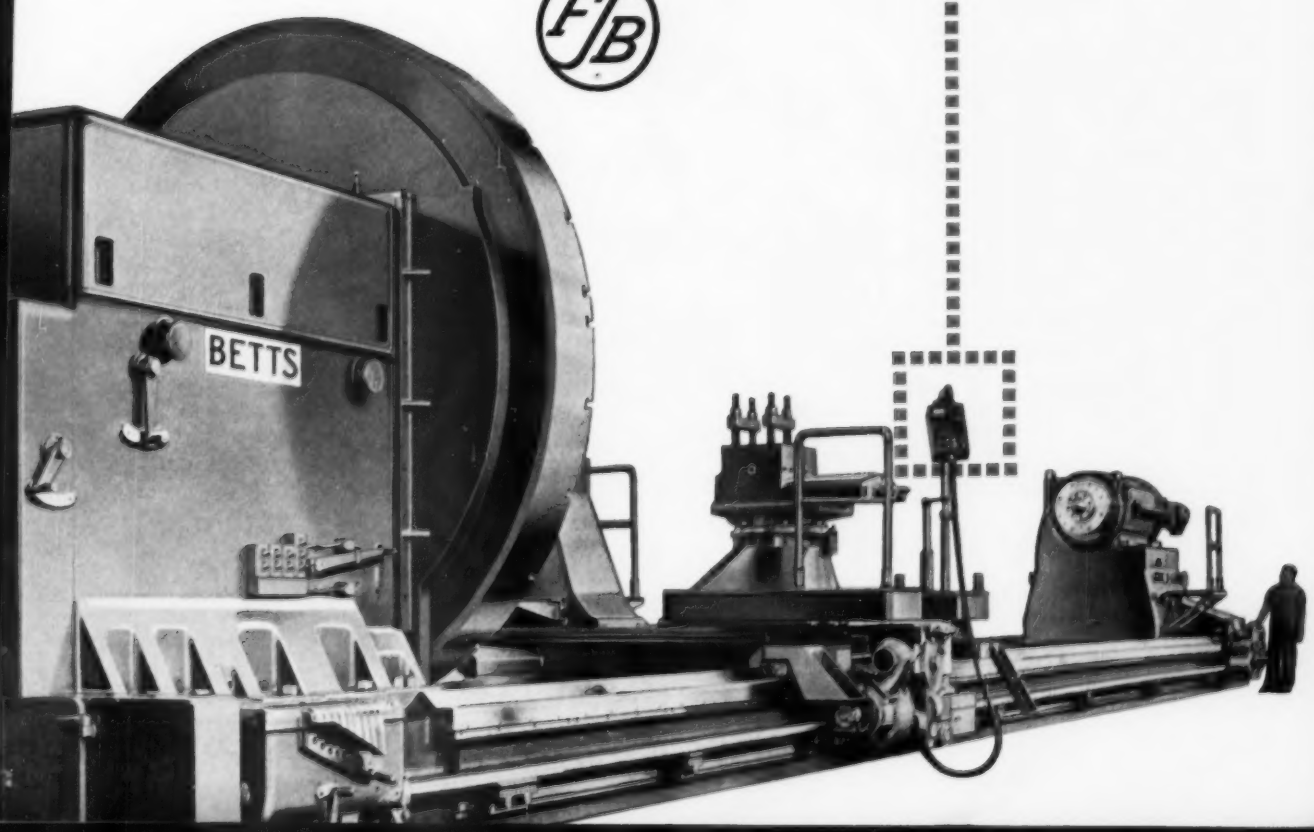
From the same panel, the operator selects feeds. Electronically controlled, they can be adjusted in fine increments. Directional power traverse of the carriage and the toolrest are also at his finger tips.

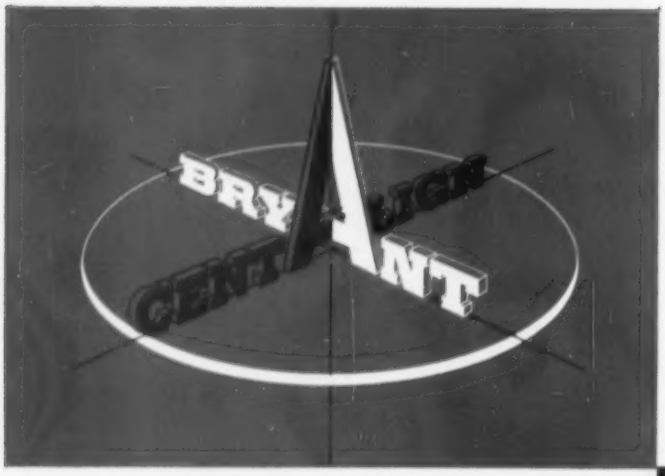
*Consolidated specializes in huge, heavy-duty machine tools such as this. Why not discuss your requirements with us?*



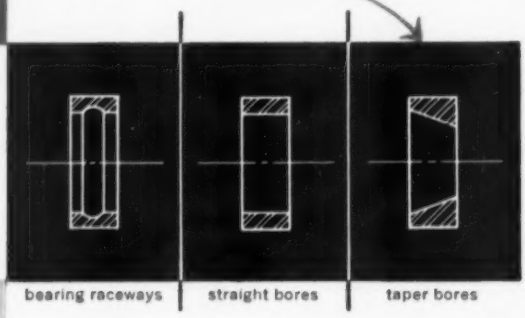
**CONSOLIDATED MACHINE TOOL DIVISION**
**FARREL-BIRMINGHAM COMPANY, INC.**
Rochester 10, N. Y.

CM-7






This taper hole, 2 3/4" dia. X 15/16" long, is ground in just 16 seconds, floor to floor.




## Get higher production and lower operating costs with the Bryant "Centalign"

Just 16 seconds, floor to floor, to remove .018 stock to close tolerances. One more proof that the "Centalign" will remove stock up to 50% faster than heavier conventional type machines.

The completely new construction of the "Centalign" offers you unprecedented production rates, continually accurate production, and reduced operating costs because it incorporates such features as **1.** All loads and controlling forces on a common plane, reducing deflection to a minimum and insuring permanent alignment. **2.** Control of machine function by readily interchangeable programming cam units, for quick job change-over and precision machine operation. **3.** Simplified hydraulic servo control system combining the advantages of both cam- and hydraulically-operated machines for accurate machine control and extremely smooth, responsive operation. **4.** Unit-type design, ideal for use in automated lines. **5.** Extremely rigid, stable construction, guaranteeing continually accurate production.

Investigate what the "Centalign" can do for you. Ask for an immediate demonstration.

# BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

*Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery*

# BUTTERFIELD

**The Butterfield tools you buy more than meet the quality control standards set for your product.**

- **Long Cutting Mileage**
- **Smoother Finishes**
- **Guaranteed Top Performance**

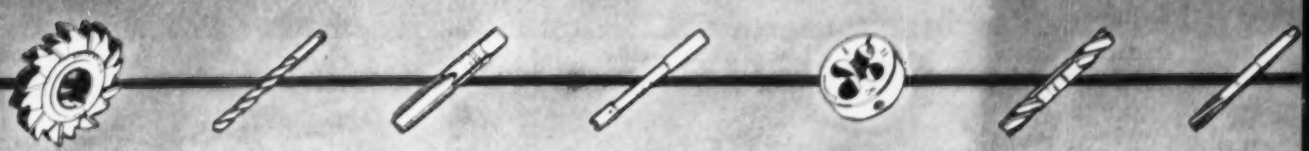
*Use Your Local Butterfield Distributor To Your Advantage.*

*You get lower inventory costs, expert counsel and "hurry-up" service.*

UNION TWIST DRILL COMPANY

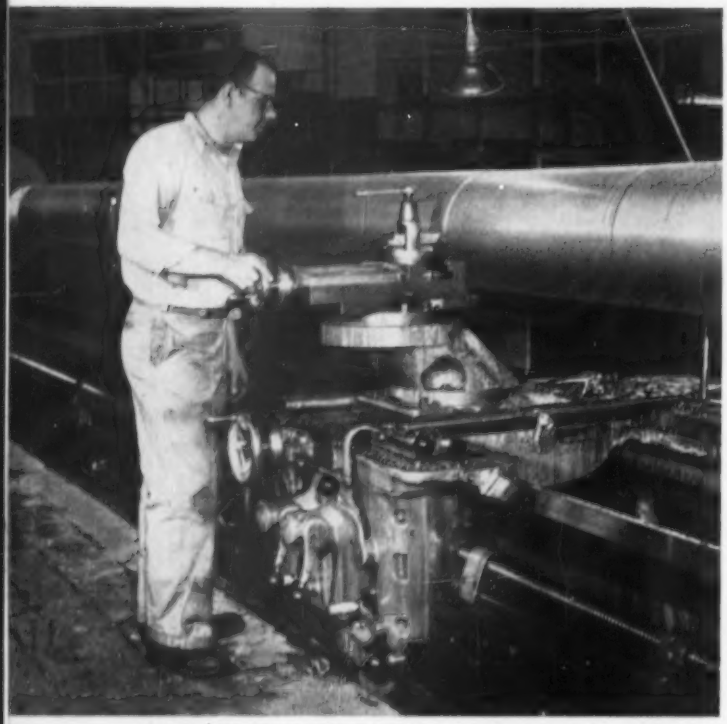
**BUTTERFIELD DIVISION**

DERBY LINE, VERMONT, U. S. A.



# AXELSON production

AXELSON MANUFACTURING COMPANY



**GREATER SPEED AND FEED RANGES** of the Axelson lathes plus rapid traverse and simple operator control were responsible for the production increase.

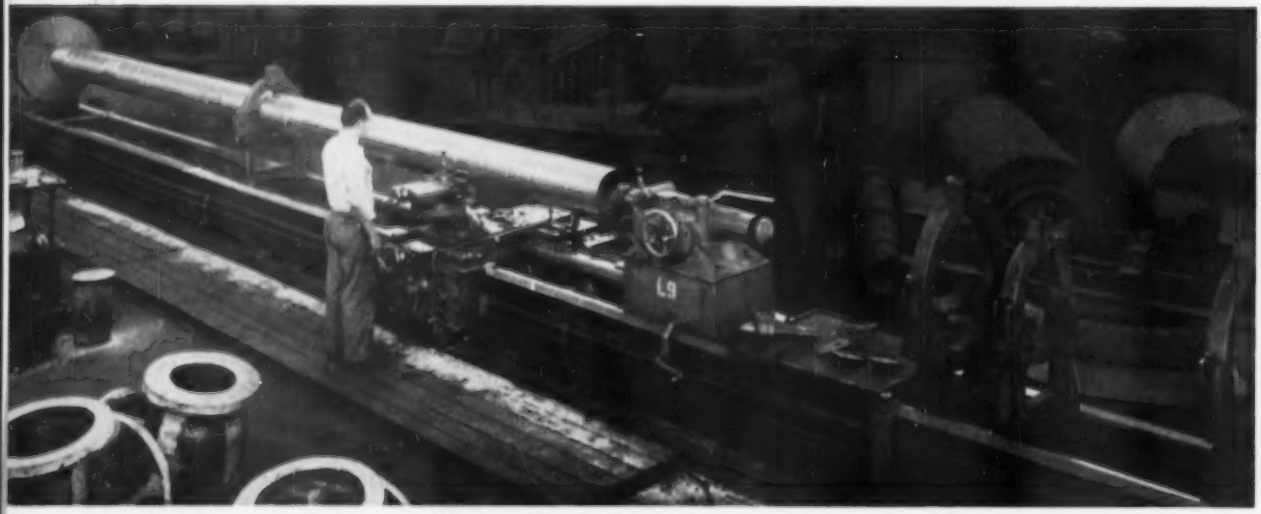
## 35% PRODUCTION INCREASE ON COLUMNS, TIE RODS, STROKE CONTROL RODS...

### for giant presses at Lake Erie Engineering Corporation

Hydraulic forming and forging presses manufactured by Lake Erie Engineering Corporation, Buffalo, N. Y. range in size from 75 to 20,000 tons and have the ability to draw a bath tub or half a car body in a single stroke.

Columns, tie rods and stroke control rods for these four column giants are turned on Axelson lathes. Since these lathes were installed production has increased 35%, and accuracy of the end product greatly improved.

A typical job on the 46 foot bed 32" Axelson is a column rod 20" in diameter and 30 feet long. Operations include turning, threading, undercutting, facing and polishing. The column is a 1030-1050 carbon steel forging. Carboloy tooling is used. Turning time is 3 days.



**ACCURACY OF THE BED AND LEAD SCREW** in addition to the extreme rigidity of the Axelson lathes have significantly increased the accuracy of the end product.

# and maintenance news

DIVISION OF U. S. INDUSTRIES, INC. / 6160 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA

## New 32" lathe features 81 standard feeds...simple selection of 45 different threads

To provide users with utmost flexibility in machining, the new Axelson 32" heavy-duty lathe has 81 feeds ranging from .005" to .351" per revolution of the spindle. Forty-five threads, from 1 to 30 per inch, are possible with the standard gear box.

By simple substitution of gears in the end train, odd threads or leads and ranges of metric module and diametrical pitches can be obtained. Two levers control the selection of feeds and leads. One lever divides the feed range into four groups. The second lever selects the feed or lead desired.

**CONVENIENT CARRIAGE CONTROLS.** All controls for operating the carriage are located on the apron convenient to the operator. Controls for both cross and longitudinal feeds are through easily operated drop levers which actuate serrated clutches to insure smooth operation and maximum power transmission. Longitudinal rapid traverse in either direction is controlled from the left side of the apron. Headstock control, to start, stop and reverse the spindle, is located on the right side of the apron.

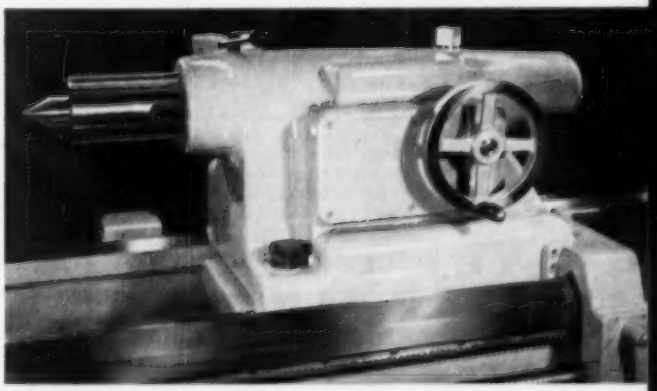
**RIGID, TWO-SPEED TAILSTOCK.** The two-speed tailstock provides a fast rate of movement where it is desirable to bring the tailstock center up to the work-piece as rapidly as possible; or a slow powerful movement of the spindle for feeding drills, reamers and other tools held in centers.

The new Axelson 32" lathe has many other outstanding features. For more information on it, the new 25/16 and other Axelson tool room, heavy-duty, sliding bed and hollow spindle lathes, write for catalogs A9-5507 and 5504.

AXELSON **Manufacturing Company**
*Division of U. S. Industries, Inc.*

**TOTALLY ENCLOSED GEAR BOX.** All gears run in continuous oil bath. Gears and shafts are mounted on anti-friction bearings for smooth, quiet operation.

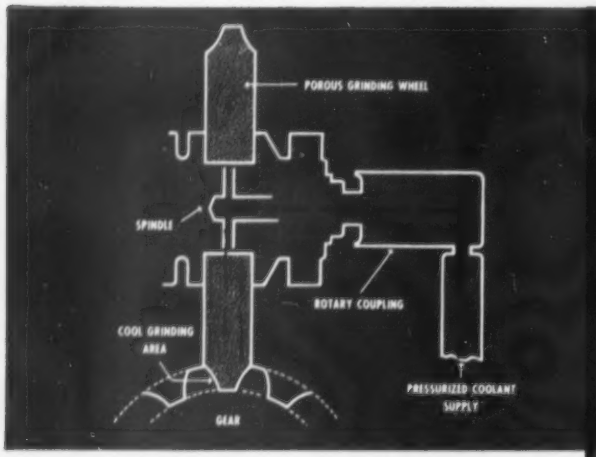
**VIBRATION-FREE CARRIAGE.** Carriage locates on hardened steel front-way and rides on wide, flat hardened steel rear-way. Result is rigid, vibrationless turning on even heaviest jobs.



**ONE-PIECE TAILSTOCK.** Tailstock is rugged, one-piece design which transmits extreme tool loads to bed. Tailstock can be clamped to bed for extremely heavy jobs.

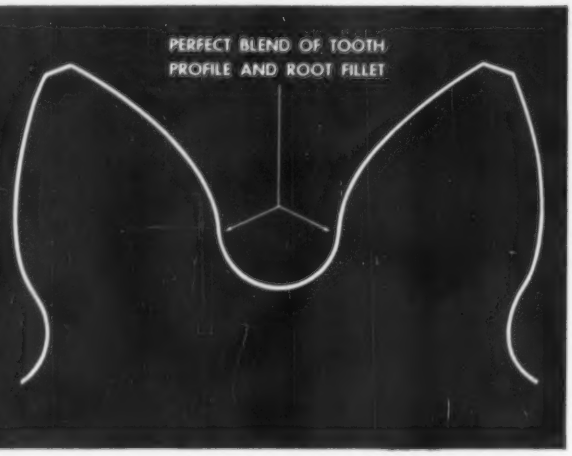
# These Unique Features

## MAKE PRECISION GRINDING OF GEARS MORE PROFITABLE THAN EVER BEFORE




**NON-TEMPERED, CASE-HARDENED GEARS**

A controlled flow of coolant through the grinding wheel is supplied to the area between the grinding wheel and the gear tooth. This feature, coupled with the automatic down feed, virtually eliminates surface tempering and grinding checks.




**PERFECT BLENDING OF FILLET AND PROFILE**

Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet. This eliminates stress risers at the critical section of the tooth.

Pratt & Whitney's J-57 Turbojet: The most powerful aircraft production engine in the world is rated in the 10,000-pound thrust class.

### 19 Gear Grind Machines are used in the production of the Pratt & Whitney J-57

At Pratt & Whitney Aircraft, where finest quality gears and high production are essential to the manufacture of the J-57 Turbojet, 19 new automatic Gear Grind Machines are in daily use. Here is what Pratt & Whitney has to say:

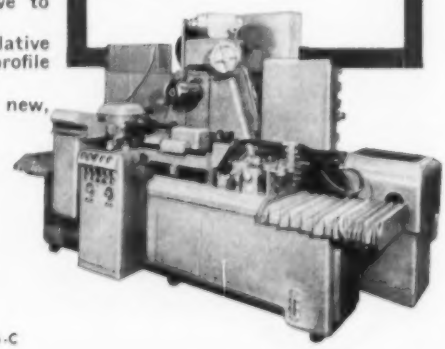
"The new Gear Grind Machines presently used in the aircraft engine division are the first major development in this type of machine since their use at Pratt & Whitney. They were developed in cooperation with Pratt & Whitney engineers to meet the specific and exacting requirements of modern aircraft engine gears. These machines are equipped with a new wheel-trimming feature and a two-speed spindle drive to eliminate burning.

"Another advantage is the relative ease with which the involute profile can be modified."

Write today for Gear Grind's new, comprehensive brochure.

### These Advanced Features Are Also Available:

- Simplified modification of the involute gear tooth profile.
- Automatic trimming of the grinding wheel assures uniformly accurate work.
- Available as fully automatic machines incorporating automatic loading and unloading.



**THE GEAR GRINDING MACHINE COMPANY**

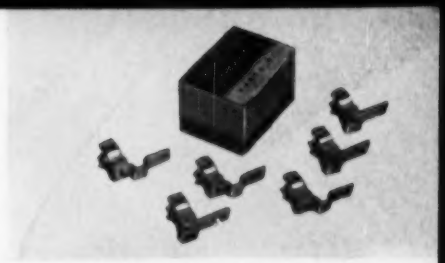
**3919 CHRISTOPHER, DETROIT 11, MICHIGAN**

Manufacturers of:
The Detroit Screwmatic 750, Automatic Screw Machine.
RZEPPA ("Sheppa") Constant Velocity Universal Joints.

56-C

How you profit by using . . .

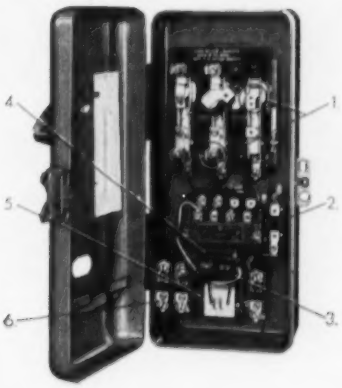
# 6 KITS TO MODIFY GENERAL ELECTRIC MAGNETIC STARTERS

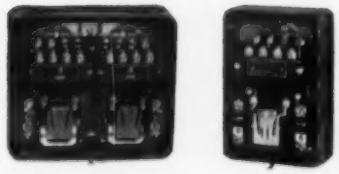


1. FUSE CLIPS can be easily changed on all G-E combination starters for use with different line current ratings or voltages.

2. AUXILIARY INTERLOCKS can add up to four additional control circuits to provide maximum flexibility for magnetic starters.

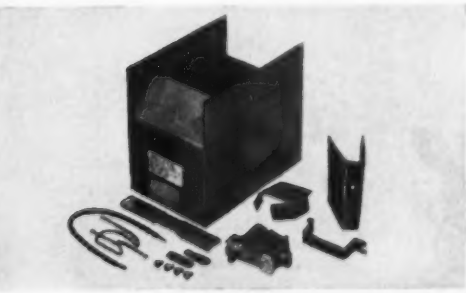
3. PUSH BUTTON for START-STOP operation can be mounted through knockout provided in the cover of G-E magnetic starters.



4. SELECTOR SWITCH fits into same cover knockout as the pushbutton unit, and gives you a choice of ON, OFF, or AUTO. setting.

5. STRONGBOX COIL can be changed quickly and easily for different voltage ratings. There is no need to disturb power wiring.



6. 3RD OVERLOAD RELAY can be added, whenever needed, to G-E magnetic starters. A screwdriver is the only tool necessary.

## KITS PERMIT ON-THE-SPOT MODIFICATION OF G-E STARTERS

These six modification kits modify any G-E across-the-line non-reversing, combination, or reversing starter. This means that your distributor can give you off-the-shelf delivery of all these forms.

If you now stock modified starters, these kits—plus standard starters—will permit you to cut inventories of "specials" and still have the starters you need. All modifications can be made quickly, and a screwdriver is the only tool needed.

Send in the coupon below for a new bulletin, complete with ordering data and "how-to-do-it" pictures of each kit. Your nearest General Electric Distributor will be glad to give you additional information.

Advertising and Sales Promotion Section G733-17
General Electric Company
Bloomington, Illinois

Please send me a free copy of MODIFICATION KITS FOR MAGNETIC STARTERS GEA-6481

NAME .....

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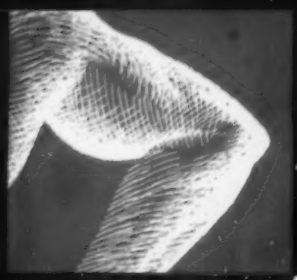
CITY ..... STATE .....

GENERAL ELECTRIC

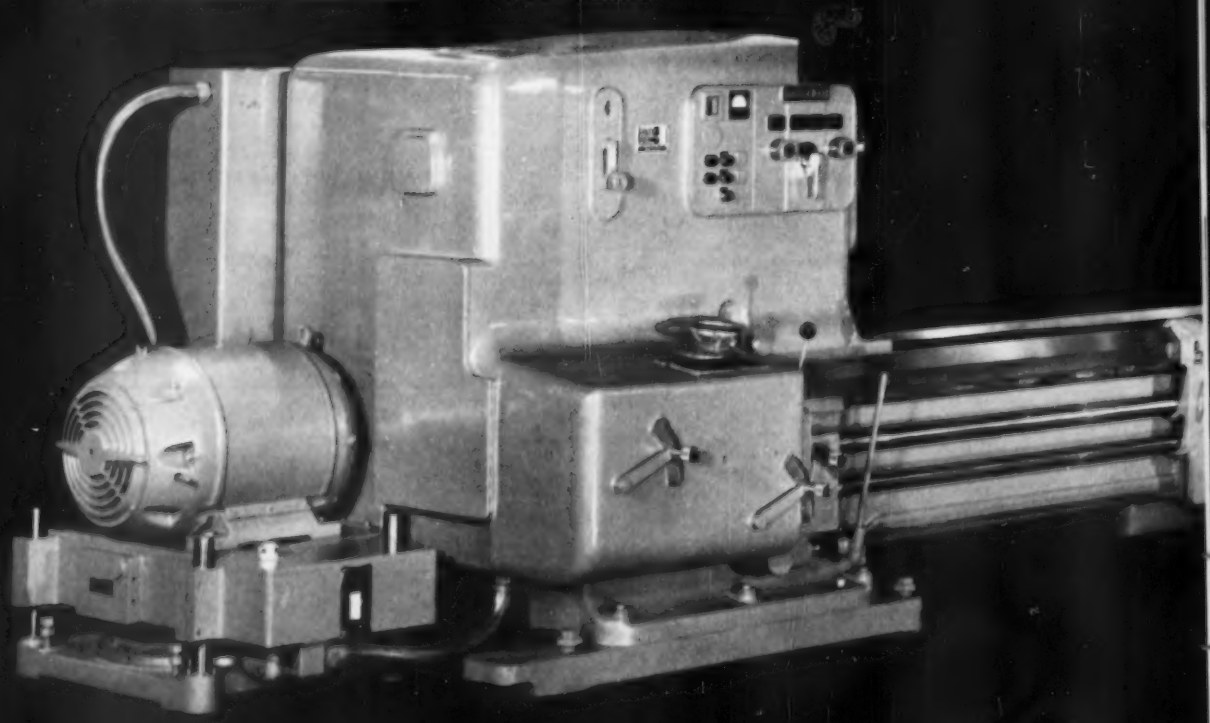


# BRAWN

## BRAINS

**The MONARCH SERIES 90 DYNA-SHIFT HEAVY-DUTY LATHE – Model 2500:** Clearance diameter —40″ . . . Swing over cross slide 25″. **Model 2501:** Clearance diameter—44″ . . . Swing over cross slide 31″. **Model 2502:** Clearance diameter—48″ . . . Swing over cross slide 36″.

When progressing from diameter to diameter, speed is changed in a few seconds with the flick of *one* dial. The *machine* calculates each speed and changes speed automatically. And the wide available range assures selection of the *right* speed for the diameter to be turned.



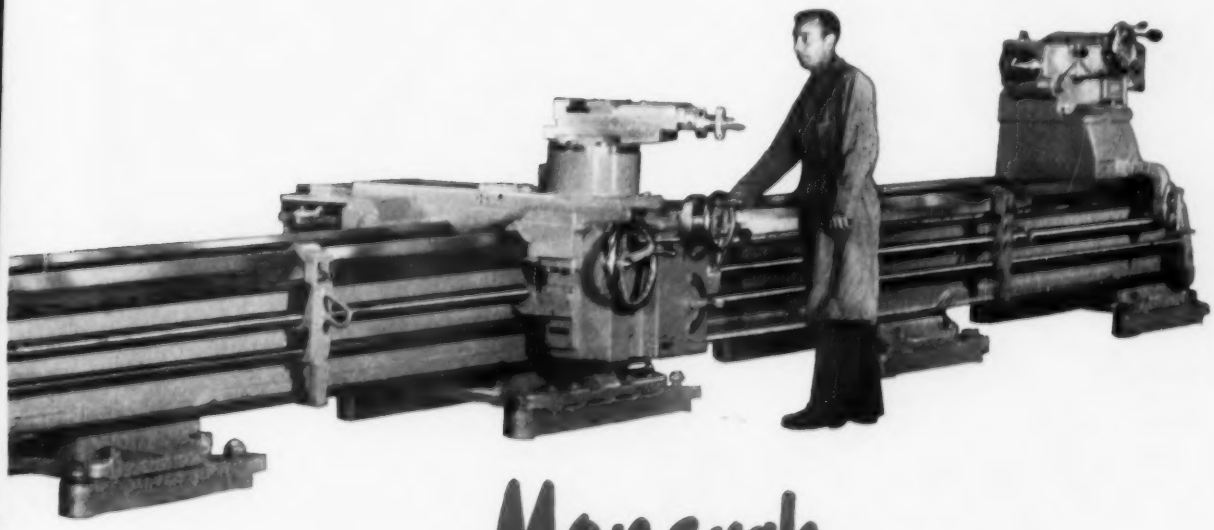
# . . The Monarch Heavy-Duty Dyna-Shift

In a class by itself! Just set the work diameter indicator. In a flash, the exclusive Dyna-Shift drive headstock calculates and delivers the ideal spindle speed (36, from 6 to 750 RPM).

You get strength and power to match the brains. The equivalent of 60 H.P. gives this lathe the power to break and the speed to burn any carbide tool. And the massive design supports the heaviest of cuts.

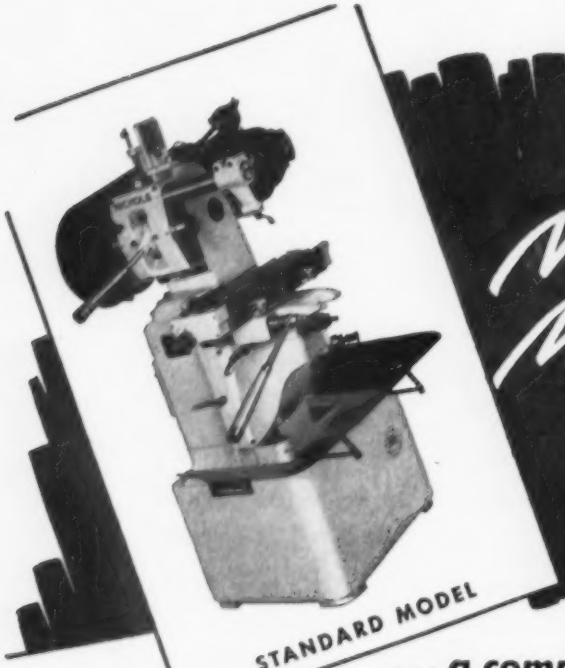
Now, you can use carbide tooling to its ultimate advantage, with metal removal rates up to 120 cubic inches per minute, turning alloy steel. Always used at proper cutting speed, you get the ultimate in productiveness, maximum tool life, and close accuracy.

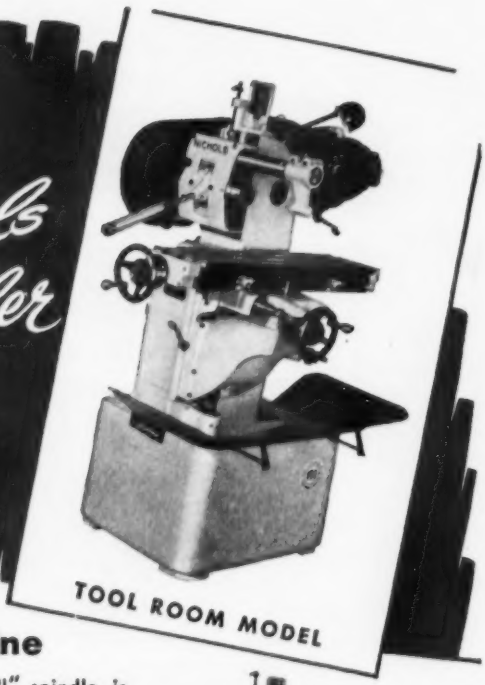
*Here's a machine you've got to know about, and our twenty-four page illustrated booklet #1601 tells you in detail. Just ask . . . The Monarch Machine Tool Company, Sidney, Ohio.*



**Monarch**
**TURNING MACHINES**

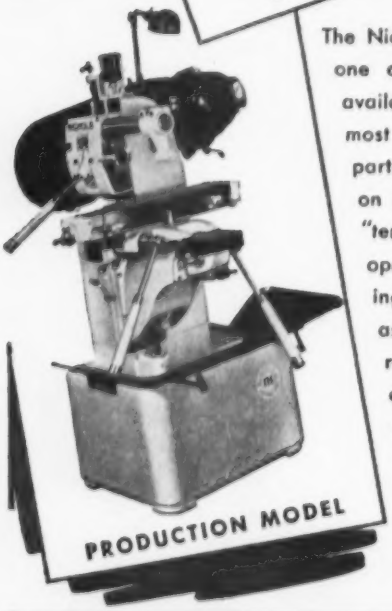
# Nichols Miller




## . . . a complete line

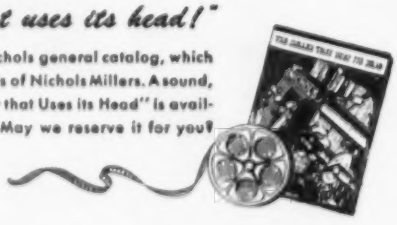
The Nichols Miller, with "rise-and-fall" spindle, is one of the most precise, universal machines available today. The four models shown, fill most basic requirements—whether for single parts with simple set-up, or multiple operations on mass production jobs with tolerances to "tenths". Their versatility makes possible such operations as facing, boring, recessing, turning, slotting, key seating and contour milling, as well as regular milling. According to requirements, screw or lever longitudinal and transverse table feeds are available optionally. "The miller that uses its head" is your best choice—and one of industry's greatest values. If you want production to "tenths", investigate the Nichols Miller.



ni

*"the miller that uses its head!"*

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie "the Miller that Uses its Head" is available for free showing. May we reserve it for you?



**CONDENSED SPECIFICATIONS**

| | |
|---|---|
| Table Working Surface | 6¾" x 21" or 30" |
| Longitudinal Travel (screw or lever) | 10" or 19" |
| Transverse Travel (screw or lever) | 7" |
| Vertical Travel — Knee | 13½" |
| Rise and Fall of Spindle | 4½" |
| Selective Speed Ranges up to 5000 R.P.M. | |
| Weight | 1250 lbs. |

**MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS**

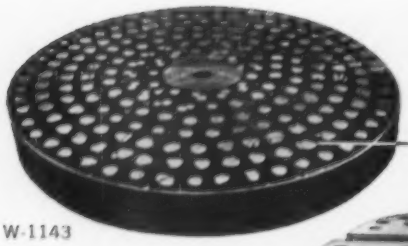
NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION**

76-F MAMARONECK AVE.
WHITE PLAINS, N. Y.

# for the best buy
# ...buy BATH

GROUND FROM THE SOLID

JOHN BATH & CO., Inc.
22 Grafton St., Worcester, Mass.

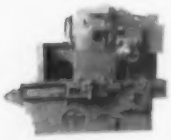


W-1143

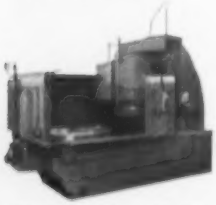
## tiny or **tremendous...**

W-1145

# For best results...***PUT IT ON A BLANCHARD!***



Blanchard No. 18



Blanchard No. 42-84

There's a Blanchard for every surface grinding job, in a broad range of sizes. For example, the Blanchard No. 18 grinds non-magnetic transistor elements (upper left) .006" thick, to a tolerance of .0005" with good finish. This job, which involved .006" to .008" stock removal per side, was held on special fixture plates.

At the other end of the scale, a huge Blanchard No. 42-84 Grinder grinds a turbine housing (upper right) which measures 83" across the corners, and is 28" high. This housing, ground after rough machining, required .020" stock removal. Both this piece and its mating part were ground to a steam-tight joint.

Whatever *you're* grinding—be it tiny watch parts, giant steel plates, or anything in between—there's a Blanchard designed to do the job speedily and accurately.

Ask for details on the 15 standard Blanchard models.

**PUT IT ON THE BLANCHARD**

*Send for free copies of "Work done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".*

**THE BLANCHARD MACHINE COMPANY** 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

# old methods can't compete

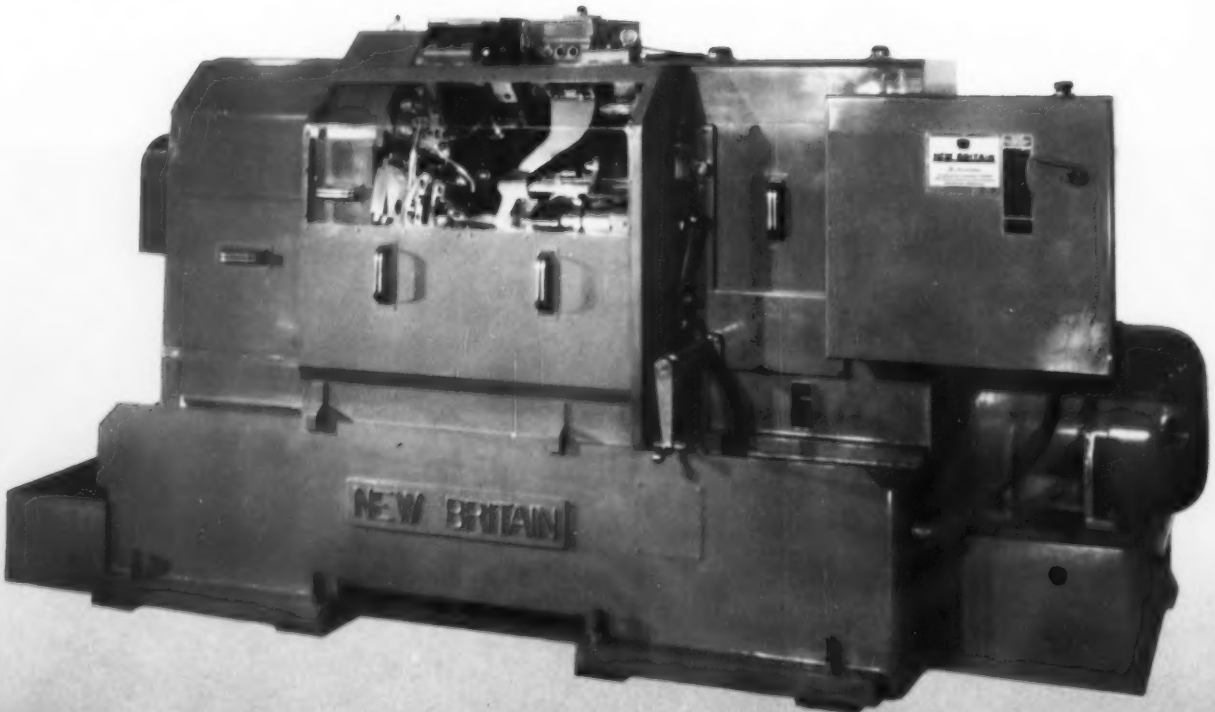
If you do *any* turning you should investigate the New Britain **+GF+** line of copy turning lathes—whether your work calls for sustained production or short runs demanding quick setups. It turns tapers and complicated contours with the same setup used for simple O.D.'s. No need for expensive form tools. Let us demonstrate this completely different approach to turning in a color motion picture demonstration at your desk.

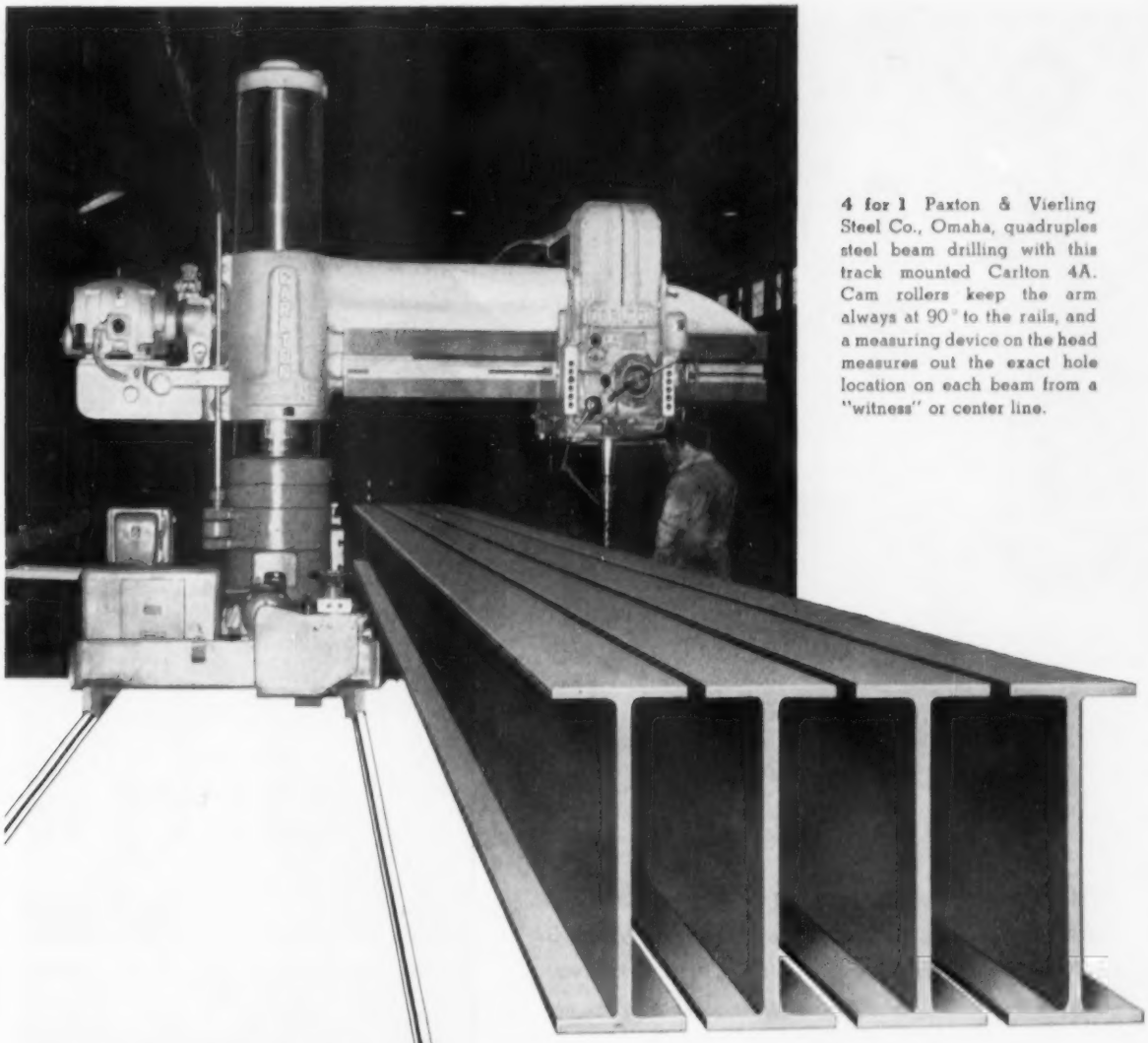
THE NEW BRITAIN MACHINE CO.
Model 11/70
New Britain +GF+
Copying Lathe
NB

# a long new step forward
# in bar machine productivity

THE NEW BRITAIN MACHINE CO.
Model 62
Automatic Bar
Machine
NB

Here is a new New Britain bar machine with the ruggedness, power, speed and versatility to shed new light on your profit picture. Where you have bar work that now requires more than one machine, it may be practical to eliminate costly finishing operations by doing the whole job on a New Britain Model 62. Ask your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





**4 for 1** Paxton & Vierling Steel Co., Omaha, quadruples steel beam drilling with this track mounted Carlton 4A. Cam rollers keep the arm always at 90° to the rails, and a measuring device on the head measures out the exact hole location on each beam from a "witness" or center line.

# structural steel drilled more efficiently with Carlton track mounted radial drills

Special track mounting takes Carlton's drilling facilities up and down the entire length of even the longest beam. 10-ft. or 100. And Carlton's long arm reaches out over several beams.

Multiple beam drilling is but one advantage of these mobile Carlton radial drills which also offer—at no extra cost: 3-unit power clamping, low-hung drive, positive tooth feed clutch, and easy economical operation and maintenance. Made in five models and many arm and column sizes. Write for descriptive bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

**Carlton radial drills** in arm lengths 3-ft. to 12-ft., column diameters 9" to 26". Also 4H and 5H horizontals.

**Carlton**
**radial and horizontal drills**

*All it takes is a local phone call to your Disston distributor. He will give you prompt, personal service from his nearby well-stocked warehouse . . . help you avoid production slowdowns.*

**YOUR DISSTON DISTRIBUTOR ALSO OFFERS YOU:**

*Large economies.* Your Disston distributor carries a wide inventory of the Disston tools you use regularly. Your purchasing, receiving and bookkeeping procedures are simplified—thus reducing your costs.

*Sound advice.* Your Disston distributor is a well-informed specialist, having wide experience in solving metal-cutting problems. As a center of information, he can help keep you informed of the latest developments in your field.

To learn more about the Disston line of fine tools—and how you can profit from using them in your plant—call your local Disston distributor.

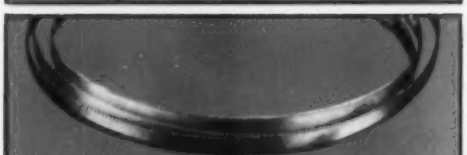
**Henry DISSTON DIVISION**
**H. K. PORTER COMPANY, INC.**
920 Tacony, Philadelphia 35, Pa.

**YOUR DISSTON DISTRIBUTOR STOCKS THESE QUALITY DISSTON TOOLS:**



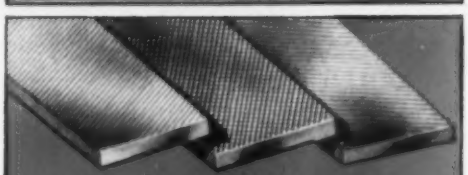
**DISSTON HACK SAW BLADES**

Sharp, clean-cutting blades for hand and machine use. Blades are carefully milled, accurately set. Wide selection: Super-Safe, High Speed Steel, Di-Mol, Chromol and Duraflex.



**DISSTON METAL CUTTING BAND SAWS**

Uniform hardness and temper, durable edges. Made in both Hard Edge Flexible Back and Hardened Throughout styles.



**DISSTON FILES**

Rugged, long-lasting files for every purpose. Wide selection: exclusive Bite-Rite® American Pattern files, versatile Multi-Metal files and precision-made Superfine® Swiss Pattern files.

# "They got Faster honing ...with 1/3 less stone pressure!"

A large manufacturer recently had a problem in engine cylinder honing after boring. Excessive time was required to bring the cylinder to the final dimension, and stone wear was high. The two honing oils being used seemed at fault.

R. J. Hughes, Sinclair Industrial Representative reports: "We made a routine call on their purchasing department at the time this situation was under study. They asked us for our solution. Based on previous experience with problems of this type, we recommended Sinclair HONOL® Light. The company agreed to test it."

## DIAL READING REDUCED FROM 4½ TO 3!

"Test results were conclusive," continues Mr. Hughes. "On the same work, Sinclair HONOL Light substantially increased tool efficiency over the two competitive oils. Back pressure on the stone was reduced from a dial reading of 4½ to 3 . . . a 33⅓% reduction . . . *while accomplishing the same rate of removal!* Naturally, this company decided to convert all of their honing machines over to HONOL Light," concludes Mr. Hughes.

If you have precision honing machines it will pay to get the facts on Sinclair HONOL Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Ave., New York 20, N.Y. *There's no obligation.*

**SINCLAIR**

**CUTTING OILS and COOLANTS**

# THE BEST THAT MONEY CAN BUY!

# Card

# TAPS & GAGES

*Presenting the Symbol of Service*

YOUR CARD DISTRIBUTOR

Card Taps and Gages are your best buy because quality, accuracy and long life are built in by Card, famous for over 80 years of precision tool manufacture. Always specify Taps and Gages by Card.

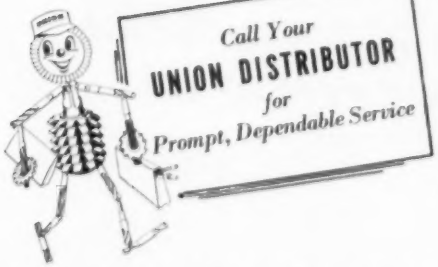
**S. W. CARD MANUFACTURING COMPANY** • MANSFIELD, MASSACHUSETTS

*Division of:* UNION TWIST DRILL COMPANY

**TAPS • DIES • SCREW PLATES • GAGES**

# A DIVERSIFIED LINE OF QUALITY!

# UNION

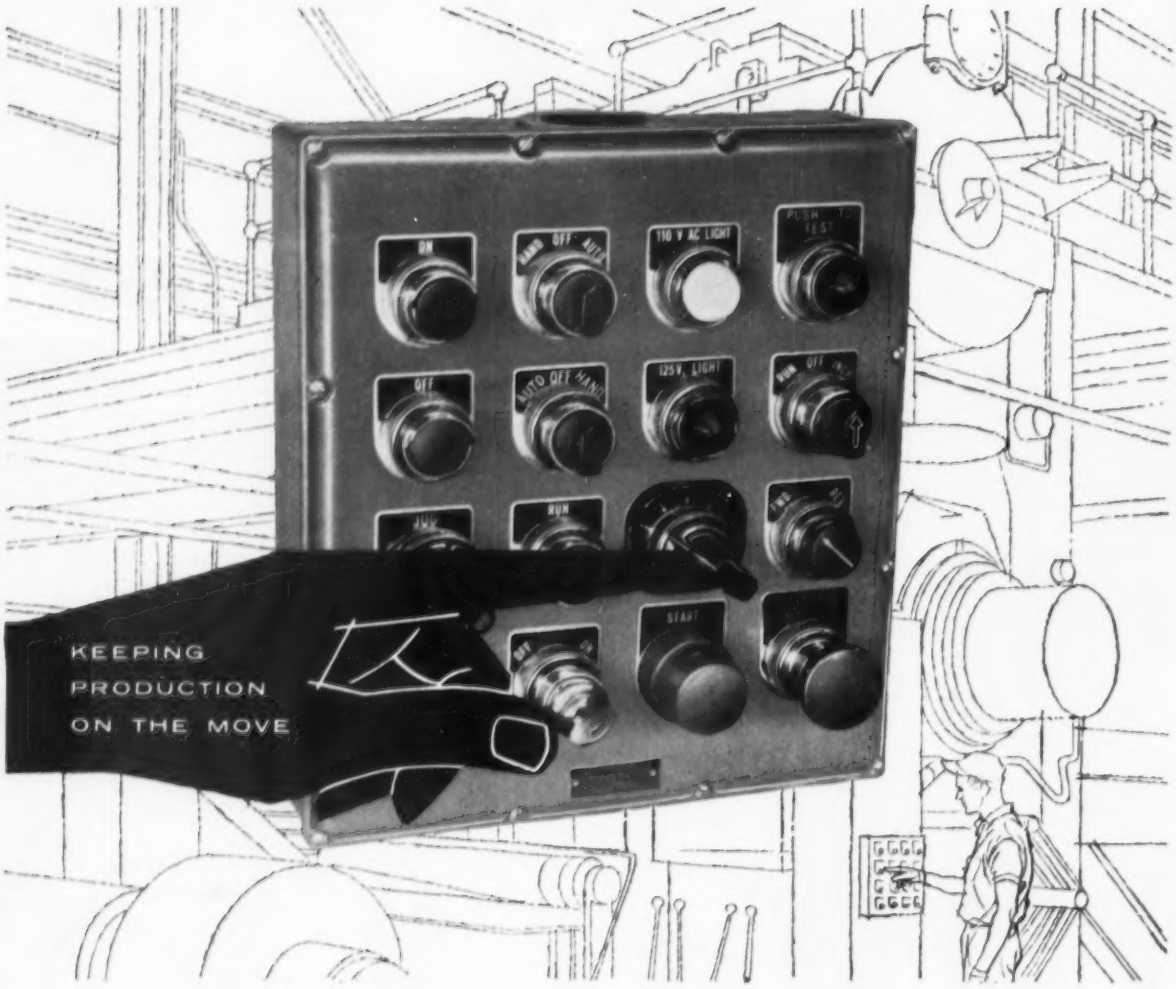



In every drilling operation there's a particular drill that will do the job for you quickly, accurately and economically.

Union offers a complete selection of top quality drills, standard and special, to suit the requirements of your job.

**UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS**

*Owners and Operators of:* S. W. CARD DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec



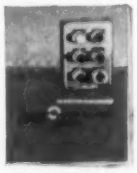

# . . . with Westinghouse Oil-Tite control stations—1 to 16 units

**Interchangeable parts** — stations, contact blocks, operators and indicating lights — right off the shelf, quickly give you a "tailor-made" Westinghouse Oil-Tite* control station to meet the requirements of any heavy-duty industrial equipment application.

**Enclosures** — die-cast and Bonderized — include cork-neoprene gasketing and close machine fits as positive seals against exposure to oil, coolants, cutting compounds, water and other foreign matter.

*Trade-Mark

## New Pushbutton Guide



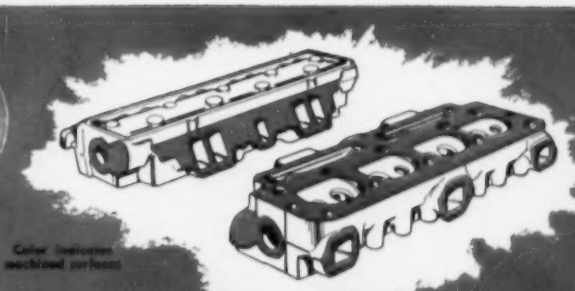
For more facts on why it will pay you to standardize with Westinghouse control stations, get a free copy of the new *Pushbutton Guide*, booklet B-6749. See your nearby Westinghouse salesman or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30210

## WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

*THERE'S A WESTINGHOUSE PUSHBUTTON TO MEET EVERY APPLICATION NEED!*

# CUSTOMER SPECIFIED



Color indicates machined surfaces

**A leading automobile company requested Kearney & Trecker's Special Machinery Division to design and build an automatic transfer machine to perform a series of milling and drilling operations on V-8 cylinder heads.**

# KEARNEY & TRECKER MILWAUKEE® DESIGNED

Kearney & Trecker built this 12-Station Automatic Transfer machine which rough and finish mills the head gasket surfaces, mills intake and exhaust port surfaces and both ends, and drills, counterdrills and reams two holes on each of two cylinder heads for V-8 engines. Machine's production rate is 100 pieces per hour.

The two cylinder heads progress automatically through the machine side by side, each on separate transfer rails. Transferring, locating, clamping, lubrication and chip disposal are all automatic.

*For more information on machine illustrated, ask for Data Sheet No. 1080. A new bulletin, SMD-56, which describes many of our outstanding designs, is also yours for the asking.*

## Production efficiency starts with

## Kearney & Trecker Milwaukee machine tools

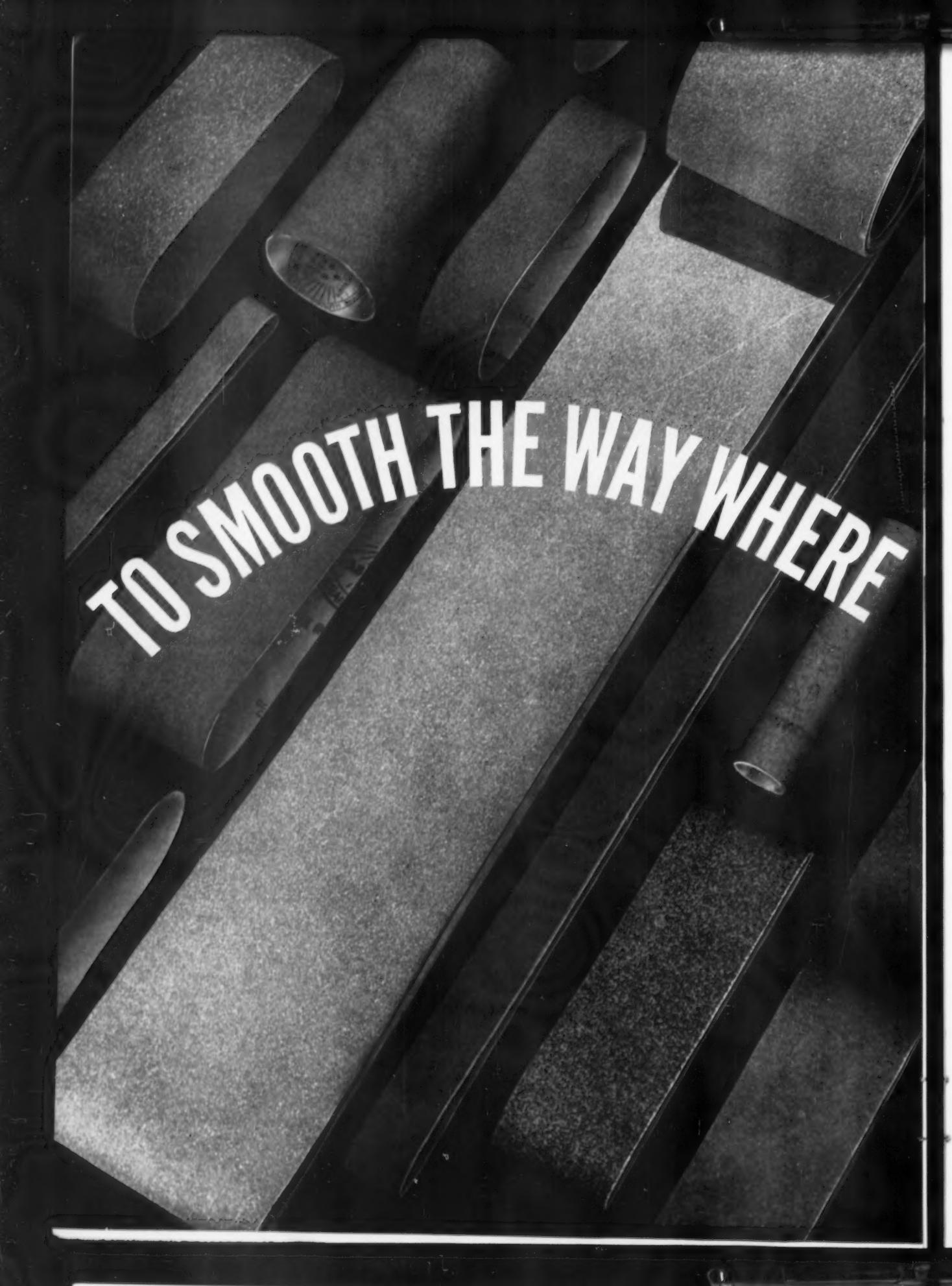
This typical example reduced costs and meant higher production for the buyer. Kearney & Trecker's Special Machinery Division's 50 years' experience in machine design and manufacture can mean considerable savings to you.

Take advantage of our abilities. They can pay off in profits for you. See or write your Kearney & Trecker Special Machinery Division representative. He will be pleased to give you all the details on this production machine. Contact him today!

*Special Machinery Division*

MILWAUKEE 14, WISCONSIN, U.S.A.

***Designers and Builders of Precision and Production Machine Tools Since 1898***


TO SMOOTH THE WAY WHERE

### THE BELT WITH A VELVET JOINT

All JEWEL BRAND Abrasive Belts are finished by the velvet joint process — a development of the AP Laboratory and a major contribution to the advance of the abrasive industry. Velvet joint belts lie smooth . . . do not jump or bump under the work.

### A COMPLETE LINE OF ABRASIVES

Abrasive Products, Inc., manufactures a complete line of JEWEL BRAND coated abrasive products in various combinations of grain, bond, backing and flexibility.

### A SPECIAL TYPE OF QUALITY CONTROL

More than modern methods and rigid standards control each step in the manufacture of JEWEL BRAND Coated Abrasives . . . there's an inherent pride of workmanship developed by long-service employees in a country-located plant that helps to assure superior quality.

# THE GOING IS ROUGH...

**CALL ABRASIVE PRODUCTS, INC.**

**South Braintree 85**
**Massachusetts**

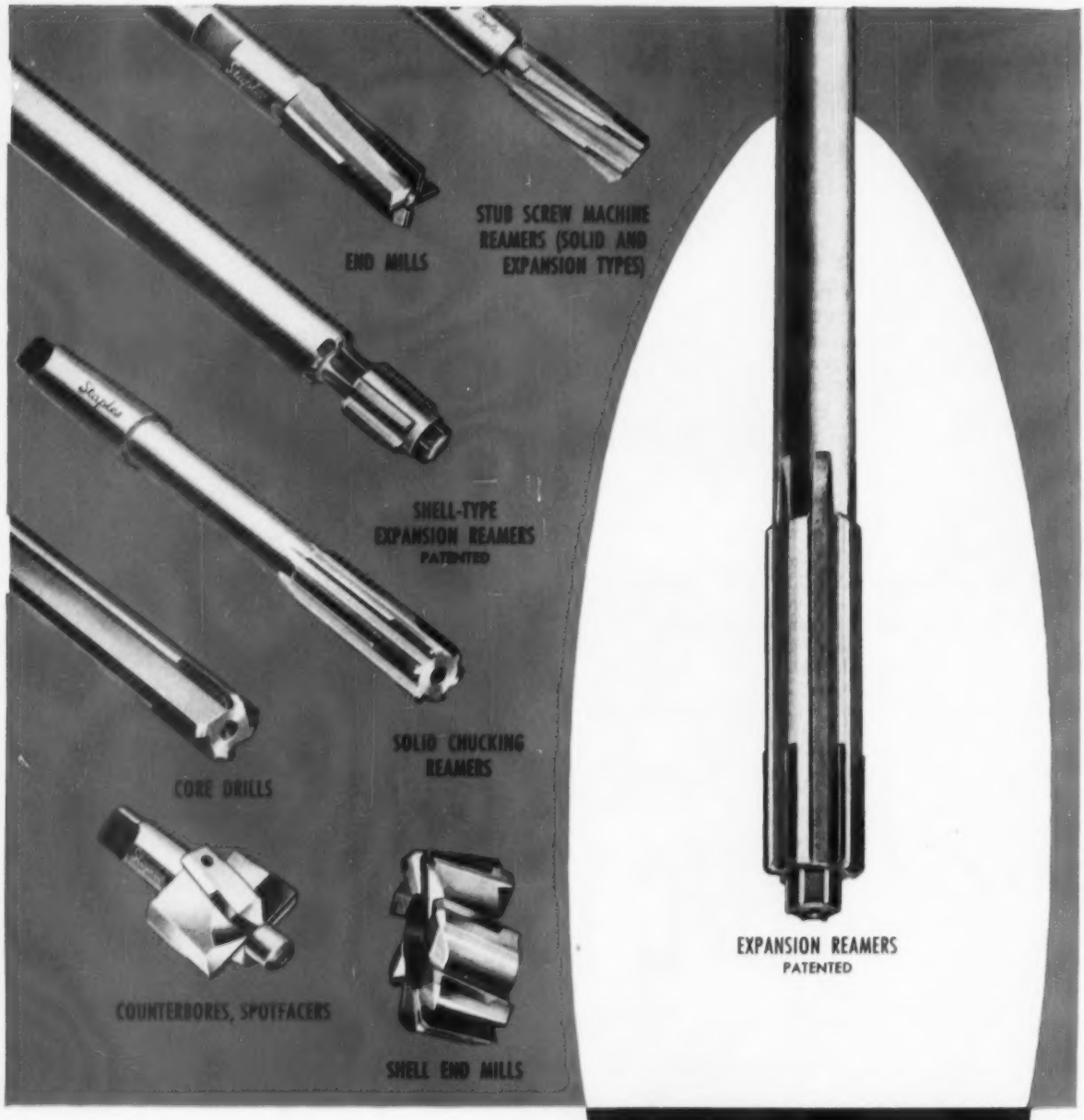
### SALESMEN WITH AN EYE ON SERVICE

AP salesmen capitalize on the flexibility of their plant facilities to provide an extra measure of service with every order, and they make a special effort to anticipate as well as know their customers' requirements.

# JEWEL BRAND

**COATED ABRASIVES**

JEWELOX • JEWELITE • JEWEL GARNET • NEW PROCESS • JEWEL EMERY • PILGRIM FLINT



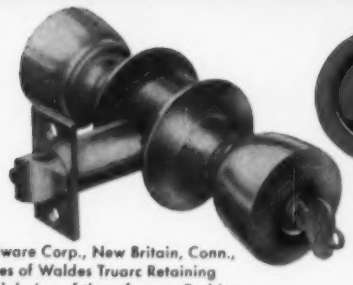

## Lower Your Costs With Staples Carbide Tools

Precision and quality built into these tools results in overall economies as proven by production records.

THE Staples TOOL COMPANY
2352 Glendale — Milford Road
Evendale, Cincinnati 15, Ohio

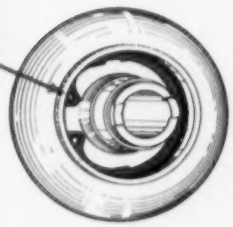
Staples
ROTATING CUTTING TOOLS CARBIDE-TIPPED

# Waldes Truarc Retaining Rings Eliminate Machining— Provide Stronger Assembly, Greater Accuracy



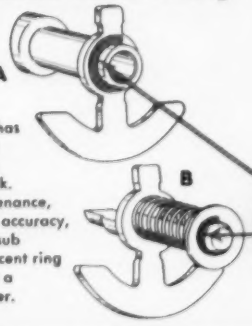
The American Hardware Corp., New Britain, Conn., uses 4 different types of Waldes Truarc Retaining Rings in the original design of these famous Corbin and Russwin Heavy Duty Cylindrical Locks. Truarc rings improve product performance, eliminate rejects, and cut labor costs.

## Knob Sub Assembly



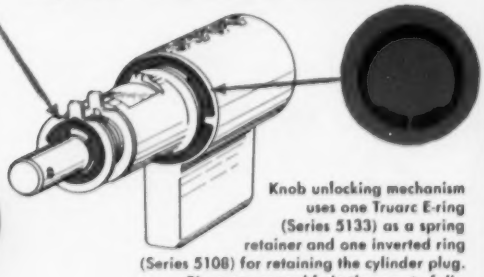
Truarc Beveled Ring (Series 5002) couples the knob to the knob shank. It eliminates two tapped holes and two screws, provides stronger assembly and greater accuracy. Beveled ring takes up end play rigidly.

## Spindle Sub Assembly




Spindle sub assembly "A" has two Waldes Truarc crescent rings (Series 5103) used as locating flanges for rollback. This saves labor and maintenance, improves performance and accuracy, eliminates rejects. Spindle sub assembly "B" uses one crescent ring as a spring retainer and as a locating shoulder for washer.

## Cylinder Sub Assembly



Knob unlocking mechanism uses one Truarc E-ring (Series 5133) as a spring retainer and one inverted ring (Series 5108) for retaining the cylinder plug. Rings are re-usable in the event of disassembly for maintenance. Rejects are eliminated.

**Whatever you make,** there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

**36 functionally different types**...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

**More than 30** engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

Send for new catalog supplement

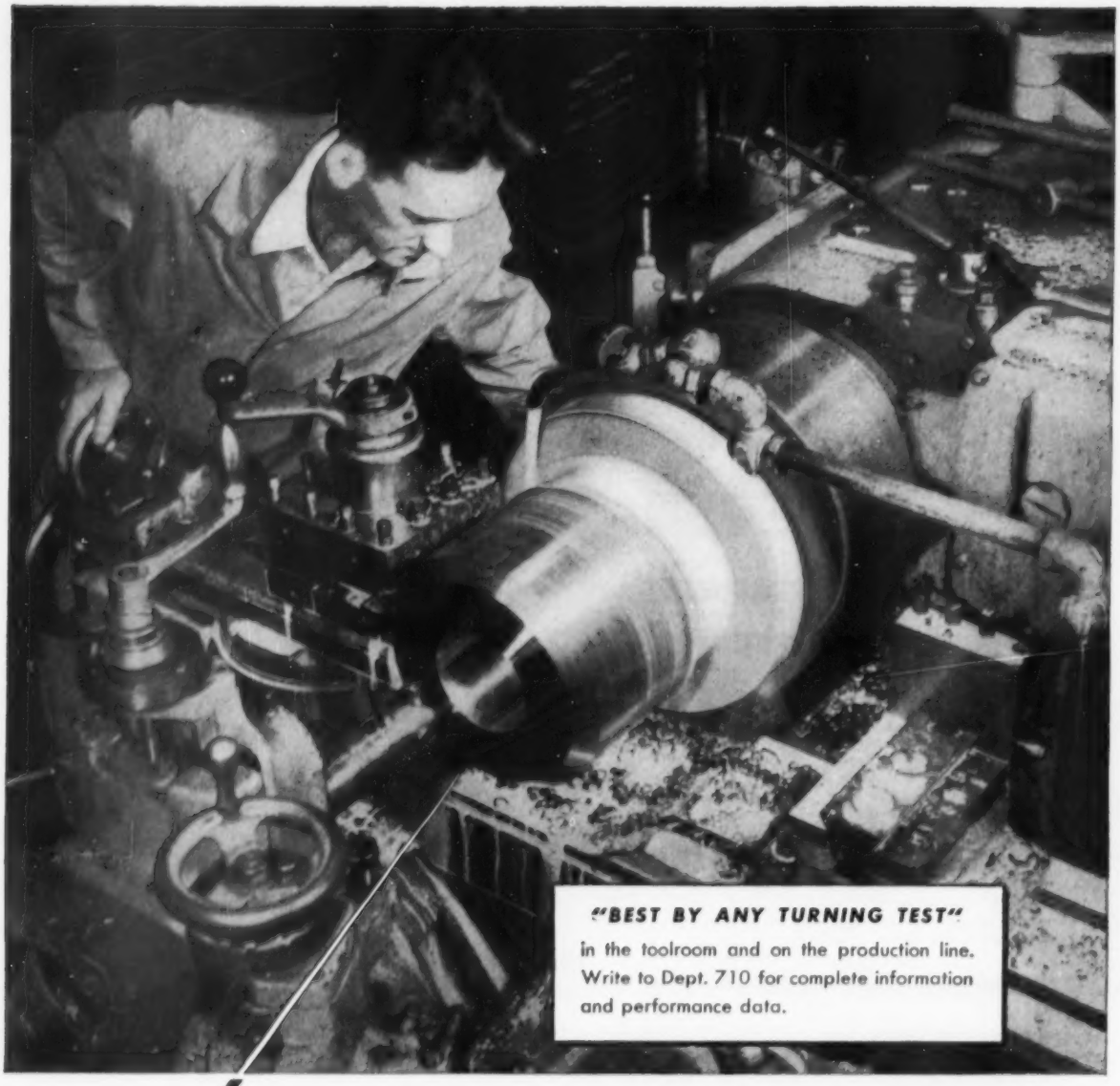
**WALDES TRUARC® RETAINING RINGS**

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
*(Please print)*

*Name* _____
*Title* _____
*Company* _____
*Business Address* _____
*City* _____ *Zone* ___ *State* _____

AM-9-56

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.


"BEST BY ANY TURNING TEST"
in the toolroom and on the production line.
Write to Dept. 710 for complete information
and performance data.

## Jones & Lamson turret lathes are BUILT and

# POWERED TO PRODUCE

**MORE CHIPS per tool**
**MORE PIECES per hour**
**MORE PROFIT per job . . . than any turret lathe of comparable size!**

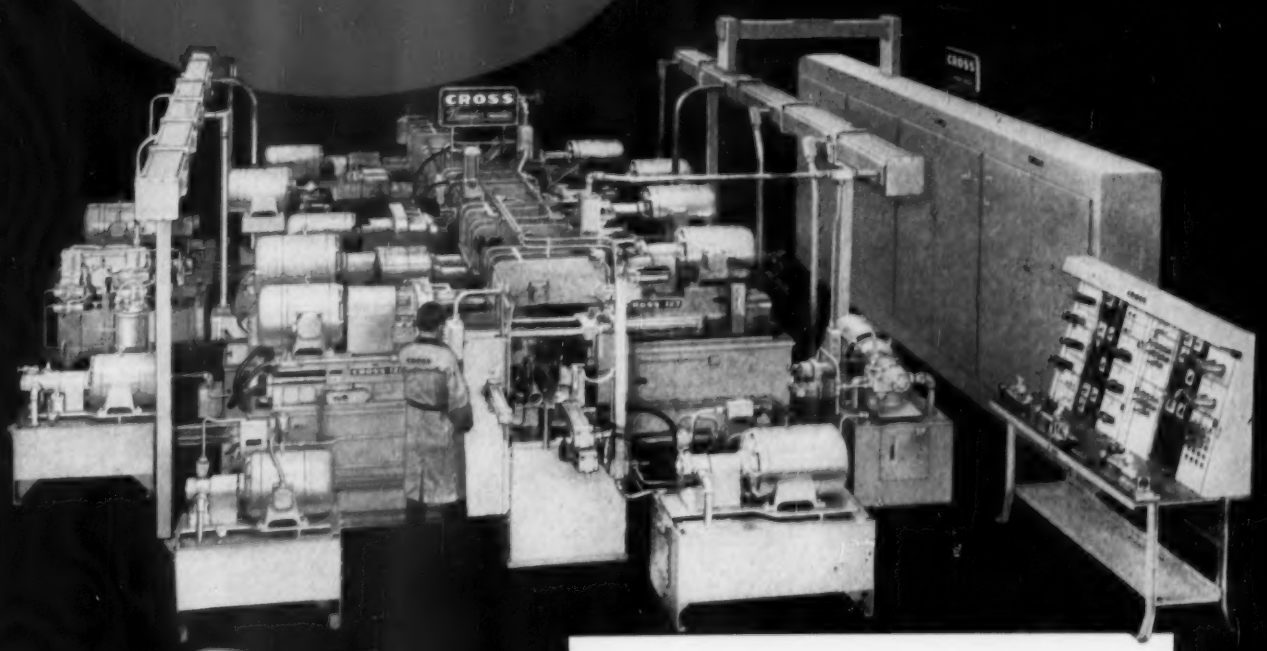
# JONES & LAMSON

the man who needs a new machine tool is already paying for it

JONES & LAMSON MACHINE COMPANY, 502 Clinton St., Springfield, Vt., U.S.A. J&L MACHINE TOOL DIV.

# Bores, Drills Chamfers, and Taps Rear Axle Housings

*Another Transfer-matic by Cross*



- ★ Rough and finish bores two tube holes; rough and semi-finish bores differential case bearing seats; rough and semi-finishes pinion shaft bore; drills, chamfers and taps ten cover screw holes.
- ★ 75 pieces per hour at 100% efficiency.
- ★ Twenty-two stations: one for loading, one for unloading, four for boring, two for back-boring, two for drilling, one for tapping, one for turn-over and ten for inspection.
- ★ Lift and carry transfer mechanism.
- ★ Cross Modular Unit Construction provides flexibility for part design changes.
- ★ All parts in Cross Machines—even details—are made to interchangeable tolerances for fast, easy maintenance.
- ★ Other features: Construction to JIC standards, hardened and ground ways, hydraulic feed and rapid traverse for boring and drilling, individual lead screw feed for tapping, automatic lubrication.

*Established 1898*

THE CROSS CO.

*First in Automation*

DETROIT 7, MICHIGAN

CINCINNATI
BICKFORD
**SUPER SERVICE**
Radials

# For faster metal drilling . . .

This ultra-modern head . . . CHARTS and PRE-SELECTS PROPER SPEEDS and FEEDS

Built in 4 foot to 8 foot arm, 13 inch to 19 inch column. Spindle speeds may be as low as 8 RPM or as fast as 1750 RPM.

**You chart, you control, you speed up operations and have a record for reference with this advanced head. The prescheduling chart plans sequence of operations and is a complete guide for the operator. Instant, quiet, hydraulic selection and changes of 36 speeds and 18 feeds are preselected by two convenient, easily read dials. Controls for clamping of column, arm and head, and arm elevation by power are at the operator's finger tips.**

***Write for Bulletin R-33 describing this ultra-modern tool***

**CINCINNATI BICKFORD**

C B SUPER SERVICE

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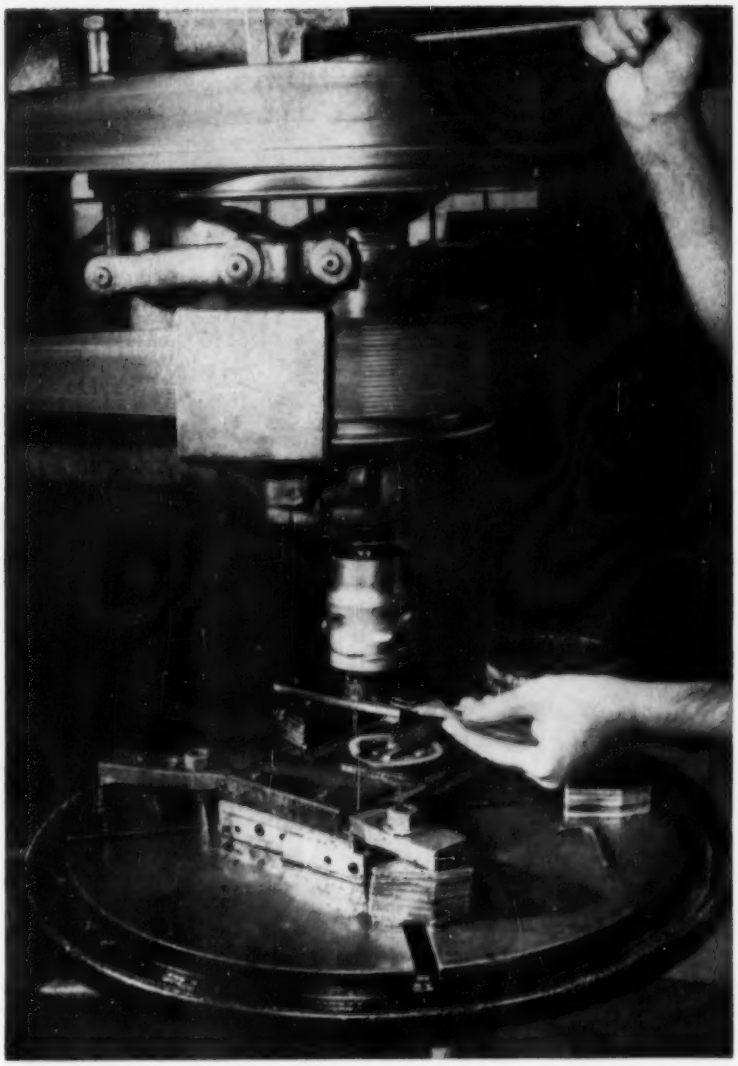
**RADIAL AND UPRIGHT DRILLING MACHINES**

## CINCINNATI BICKFORD DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

# "INCREASED TAP LIFE FROM 250 TO 4000 PIECES"



**Cities Service Chillo Cutting Oil produces astounding results for C.S.S. Machine & Tool Company, Philadelphia, Pa.**

Metal stamping . . . precision grinding . . . machining . . . stud welding . . . tool and die making. These are some of the expert operations performed by the 120 skilled employees of C.S.S. Machine & Tool Company of Philadelphia . . . operations based on many years' knowhow and teamwork. And for the past year, with Cities Service cutting fluids, this work has been done with even greater precision, greater efficiency than ever before.

In its tapping operation, for example, C.S.S. increased tap life from an average 250 pieces to over 4000 pieces with Cities Service Chillo Cutting Oil. And in a drilling operation with its Brown and Sharpe Automatics, time required to make one piece was cut from 240 to 165 seconds!

Says President F. G. Schutz: "Cities Service Chillo Cutting Oils are the best we've ever seen. Likewise, Cities Service Lubrication Engineers. It's wonderful to deal with someone who knows our operation so well and has products that help improve it."

If you have a lubrication problem, or even if you're running smoothly, talk with a Cities Service Lubrication Engineer. He's known for solving problems, known for making smooth operations still smoother. Or, if you prefer, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

**CITIES SERVICE**

QUALITY PETROLEUM PRODUCTS

Cleveland-equipped 30-ton traveling hoist in plant of the builder, S. Morgan Smith Co., York, Pa.

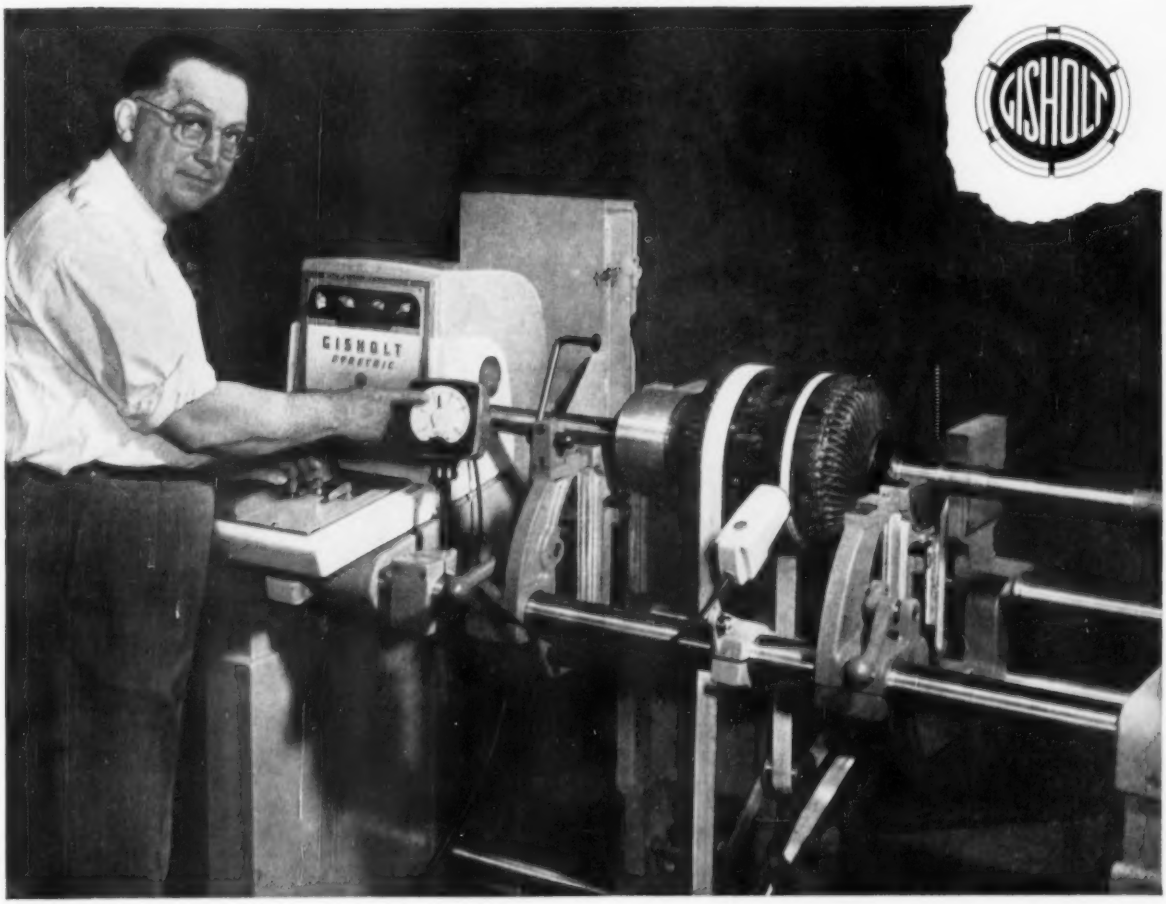
# 30-ton traveling hoist operated by 3 CLEVELANDS

TO ensure precision control of the hoisting drums of this traveling hoist, the builder installed a team of Cleveland Worm Gear Speed Reducers. Double reduction of motor speed is effected through an efficient hook-up. Gear shaft of the smaller center unit is extended on each side and connected with the input axles of two larger units which operate the hoisting drums at desired low speeds.

Clevelands fit perfectly into complex power transmission jobs. They're compact—right angle construction of a worm gear drive saves space. High shock load resistance and efficient performance are inherent. Parts are reduced to a minimum, reducing maintenance. Torque flow is smooth and uninterrupted. The case-hardened steel worm and nickel-bronze gear actually improve with use.

Wherever you have a power transmission need or problem, simple or complex, find out how a Cleveland speed reducer can handle it dependably and economically. Send for Catalog 400 today. The Cleveland Worm & Gear Company, 3254 East 80th Street, Cleveland 4, Ohio.

*Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited*




# When a GISHOLT BALANCER tells you the story —you don't have to translate it!

Note that dial reading! It does more than you may suspect.

Unlike other balancing machines, it does not merely indicate amount of unbalance in arbitrary units and leave it to the operator to interpret in terms of correction. Gisholt Balancers can tell the story *directly* in terms of correction units. No translation needed. No computation. No charts or graphs.

Because of their infinitely variable sensitivity, Gisholt Balancers are easily adjusted for the job at hand. Correction units such as ⅛" lengths of wire solder, $\frac{1}{64}$" depths for a certain size of drill, washers of a specific weight, etc., can be used. Readings, in terms of these units, are shown directly on the amount meter.

Think what that means in time saving alone! Yet this is only one of many ways Gisholt enables you to set—and maintain—higher standards for your balancing work.

If your product includes the use of rotating parts, by all means check Gisholt for the most recent information on balancing.

GISHOLT

**MACHINE COMPANY**

**Madison 10, Wisconsin**

DYNETRIC BALANCERS GISHOLT

**TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES**

To help you cut production costs . . .

# NEW General Electric

# D-c Power Source

**KINAMATIC** — — — a new standard in direct-current generators and motor-generator sets—designed to give you higher output at less cost.

As a progressive manufacturer, you are faced with the problem of boosting factory output and beating rising production costs. Where your production process involves adjustable speed, tough duty cycles, frequent reversals or speed matching, you may have already applied the performance advantages of d-c drives. To help you further boost production and reduce your automation costs, completely new sources of constant and adjustable-voltage d-c power are now available—General Electric d-c Kinamatic generators and m-g sets, $\frac{3}{4}$–100 KW.

**More Power Per Dollar**—D-c Kinamatic generators pack more power per frame size than any previously designed G-E generator. Nine new kilowatt ratings more closely match both the power requirements of your standard d-c drive motors and the power output of standard prime-moving a-c motors. This new matching gives you a more efficient, more compact adjustable-voltage drive at lower cost.

**And a Lot More**—A d-c Kinamatic generator or motor-generator set can give you much more than savings on initial automation costs. If you would like to know more about the construction details, advanced performance characteristics and money-saving maintenance features of d-c Kinamatic generators and m-g sets, we would like to have a G-E Apparatus Sales Representative call on you. Or, if you prefer, we will send you copies of GEA-6461 and GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-2

* Trade mark of General Electric Company

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

# what's the DIFFERENCE . . .

## the DIFFERENCE is . . .

To you, the user or buyer, the most important difference between MARVEL High-Speed-Edge Hack Saw Blades and ordinary blades is the *unequalled* performance you get from MARVEL Blades.

Performance reflected in higher production (faster cutting-off), greater accuracy of cut-off blanks, and longer blade life has made MARVEL the preferred blade in every kind of metal sawing operation.

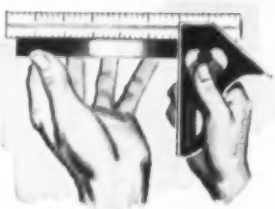
To get the *difference* in performance, always insist on MARVEL High-Speed-Edge Hack Saw Blades. Leading Industrial Distributors have them in stock.

**Write for "The MARVEL Story." It has complete details on MARVEL High-Speed-Edge Hack Saw Blades and Hole Saws.**

### HIGHER PRODUCTION

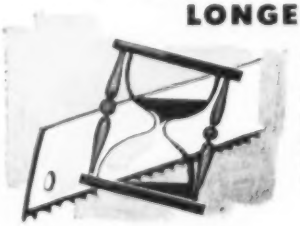
Unbreakable MARVEL High-Speed-Edge Blades can be worked faster and harder than any other blade with complete safety. They will withstand the highest speeds and heaviest feeds attainable on any make hack sawing machine. MARVEL Blades will cut any machineable metal. No wasted time changing blades for different materials.

### GREATER ACCURACY



Composite construction permits MARVEL Blades to be tensioned from 200% to 300% more taut than ordinary blades. This produces greater rigidity of the high-speed-steel cutting edge, resulting in maximum obtainable accuracy of cut-off blanks.

### LONGER BLADE LIFE



Each MARVEL High-Speed-Edge Hack Saw Blade is triple tempered to assure maximum toughness of the cutting edge. MARVEL Blades not only give you longer life, they assure a *more efficient* cutting life, with resulting lower blade costs.

B-1121

**ARMSTRONG-BLUM**
MFG. CO.
5700 WEST BLOOMINGDALE AVE. • CHICAGO 39, ILL

MARVEL *Metal Cutting* SAWS
Better Machines—Better Blades

# 61 models

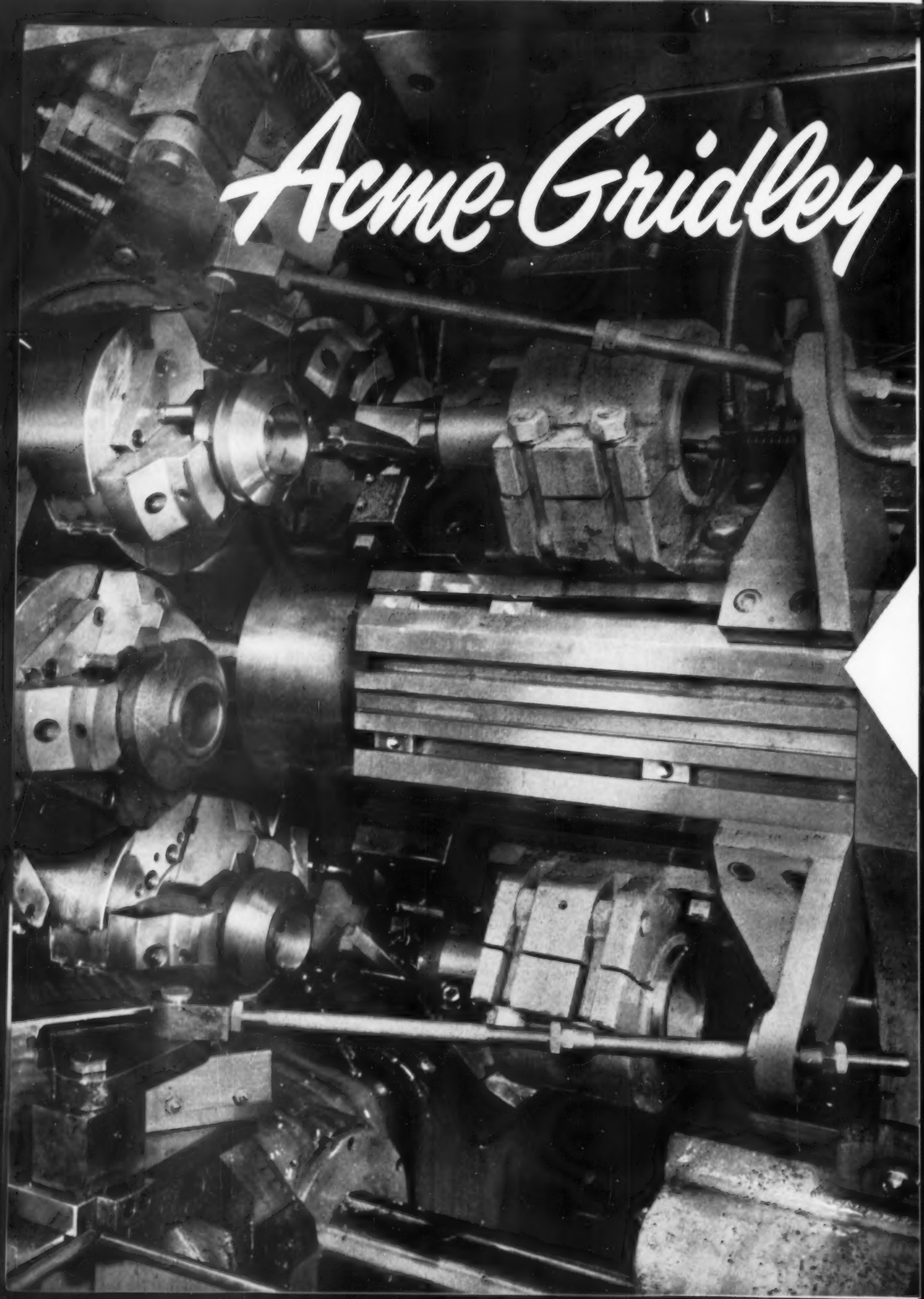
A machine not put to its best use is theoretically idle. Proper machine selection is an important factor in the profitable use of a multiple spindle automatic. So extensive are the demands on this type of lathe that no single model—or number of models—can be expected to efficiently handle the wide range of work available.

To excel in any range of work a multiple spindle automatic must be specifically designed for that range. That is why CONOMATICS are provided in so many models. In no other way can the purchaser be assured of the best possible machine for his particular requirements.

*Write for your copy Today*

# Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.


Acme-Gridley

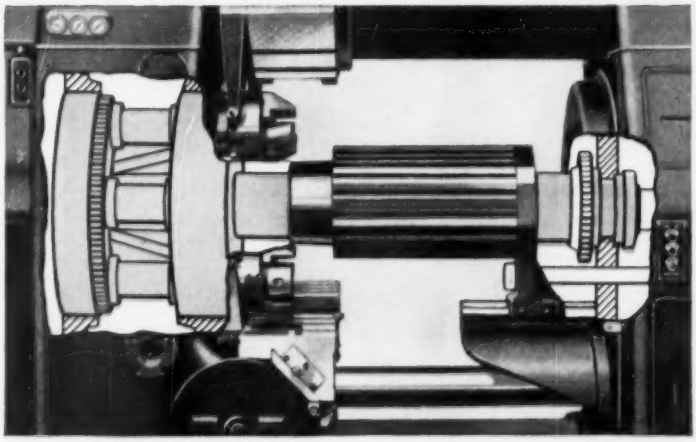
# sound basic design

## means greater production at lower cost

Accurate alignment of the tools and the work, every time the carrier indexes—and the rigid maintenance of this very precise alignment throughout every machining operation—provides greater precision all day long, less inspection, fewer rejects.

This accuracy resulting from sound basic design is one of the many reasons why Acme-Gridleys are setting new records for consistently accurate production every day.

- Spindle carrier integral with stem.
- End toolslide provided with bushings closely fitted to carrier stem and protected by front and rear seals.
- Toolslide further supported by rugged guide arm to heavy guide plate below carrier stem.
- Two wide spindle carrier bearings in headstock frame and a heavy-duty bearing in gear box provide maximum support.



**LET US TELL YOU MORE ABOUT *Acme-Gridley* BASIC DESIGN**

This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

# National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

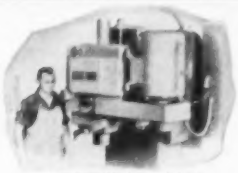
SALES OFFICES: • Newark, N. J. • Chicago, Ill. • Detroit, Mich.

# From Elements Like These

## Together with SUNDSTRAND "Engineered Production"

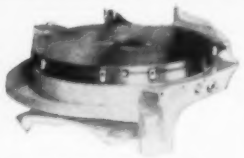
**TRAVELING HEADS**

Self-contained units with ways for horizontal or angular travel.



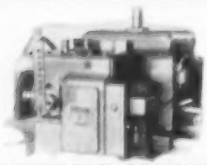
**VERTICAL OR HORIZONTAL HEADS**

Available in capacities from 3 to 100 H.P.



**ROTARY TABLES**

Available in several sizes for continuous or rotary milling operations.



**ADJUSTABLE COLUMNS**

Movable columns provide maximum cutting rigidity for horizontal heads over a wider range for milling both large and small work pieces.

**HORIZONTAL TABLES**

Available in widths from 10½" to 96" and feed strokes from 18" to 216".

**ALL ANGLE HEAD**

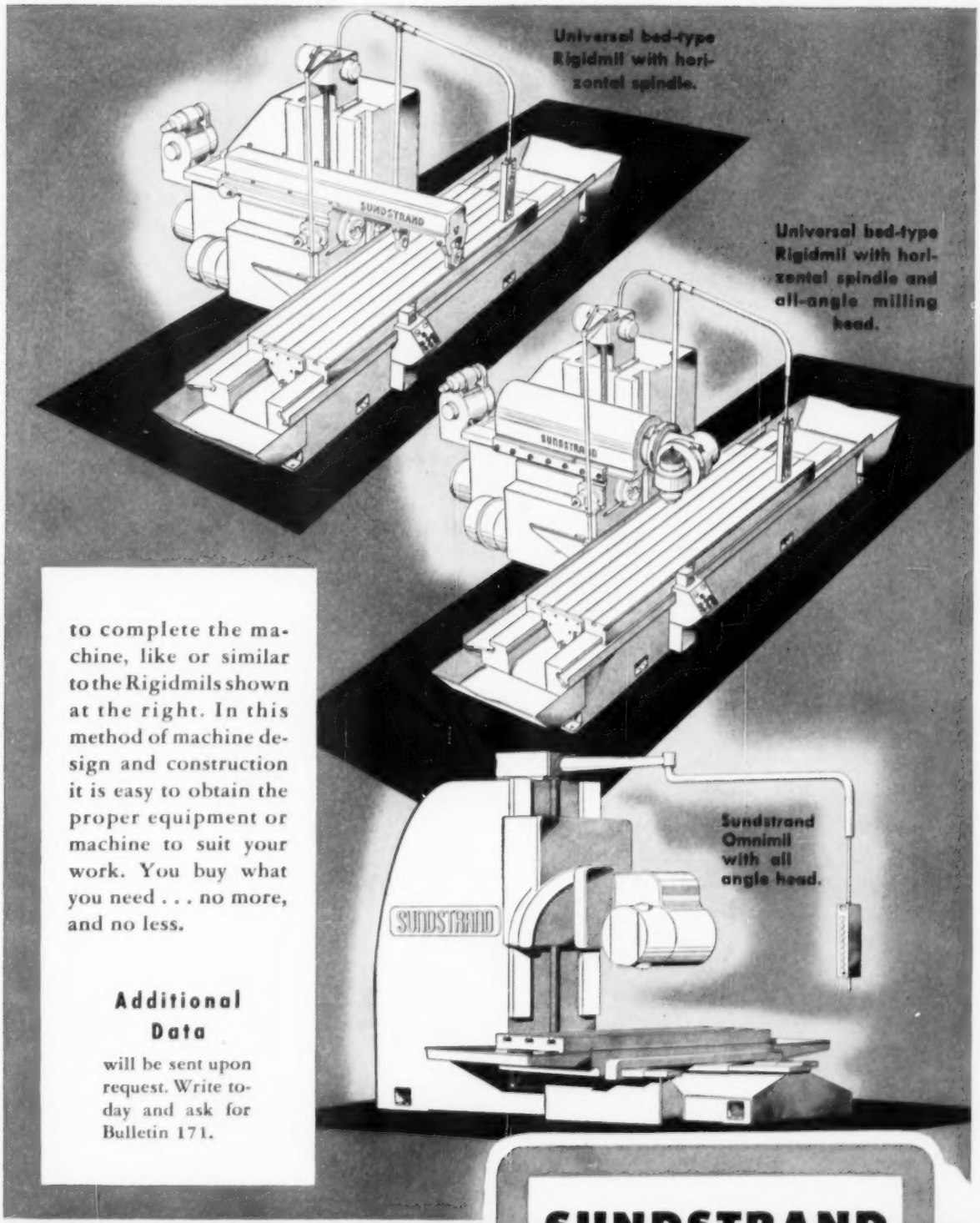
Available up to 25 H.P.

## ...You'll get the exact machine for your requirements

Sundstrand Rigidmils are built from standard machine elements as shown above. After the correct tooling for the job has been determined, the proper combination of machine elements is assembled

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

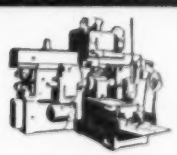

Universal bed-type Rigidmil with horizontal spindle.
Universal bed-type Rigidmil with horizontal spindle and all-angle milling head.
Sundstrand Omnimil with all angle head.
SUNDSTRAND

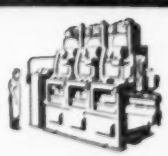
to complete the machine, like or similar to the Rigidmils shown at the right. In this method of machine design and construction it is easy to obtain the proper equipment or machine to suit your work. You buy what you need . . . no more, and no less.

**Additional Data**

will be sent upon request. Write today and ask for Bulletin 171.

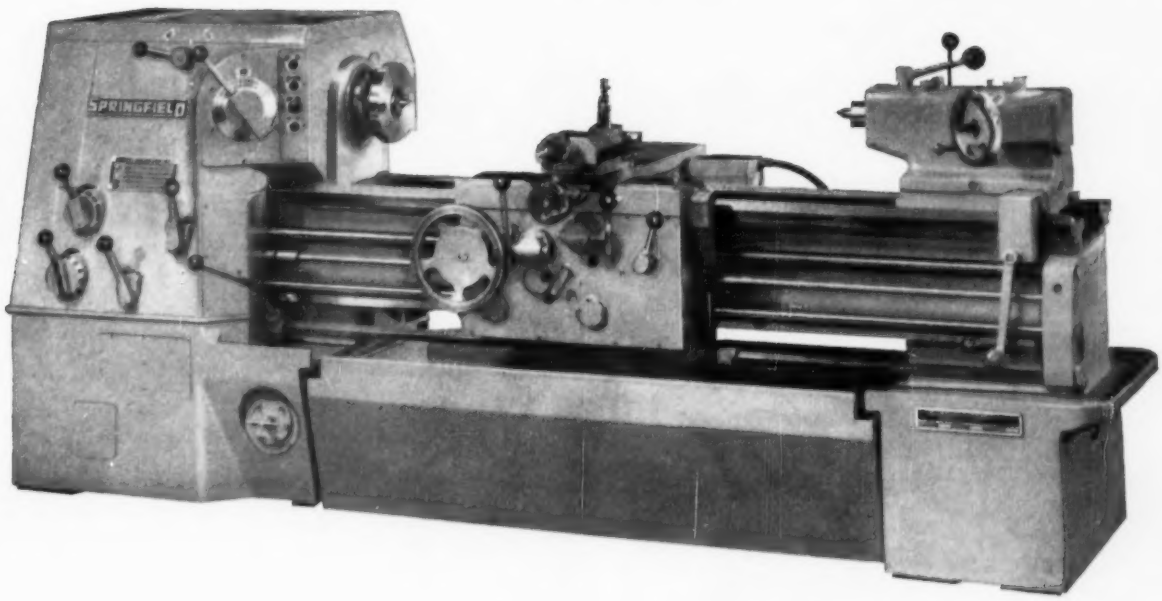
TRIPLEX RIGIDMILS | SPECIAL MACHINES





**SUNDSTRAND**
**Machine Tool Co.**
2533 Eleventh St. • Rockford, Ill., U.S.A.

SPRINGFIELD




# more useful horsepower

All the horsepower in a Springfield Model "S" Lathe is productive.
A simple, straight-forward gear train, plus double-action lubrication, plus tight dynamic balance tolerances (.0005" displacement) eliminate friction and vibration, the twin horsepower thieves.
In the headstock, only the gears necessary to a given speed are engaged. Other gears run free with a stabilizing flywheel action, no drag on power.
A high pressure filtered oil mist keeps all gears and bearings drenched, and a cascade of oil lubricates the feed box.

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".
Vertical Universal Grinders: swings 18" to 42".

*The Springfield Machine Tool Company*
*Springfield, Ohio*

68TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD

New

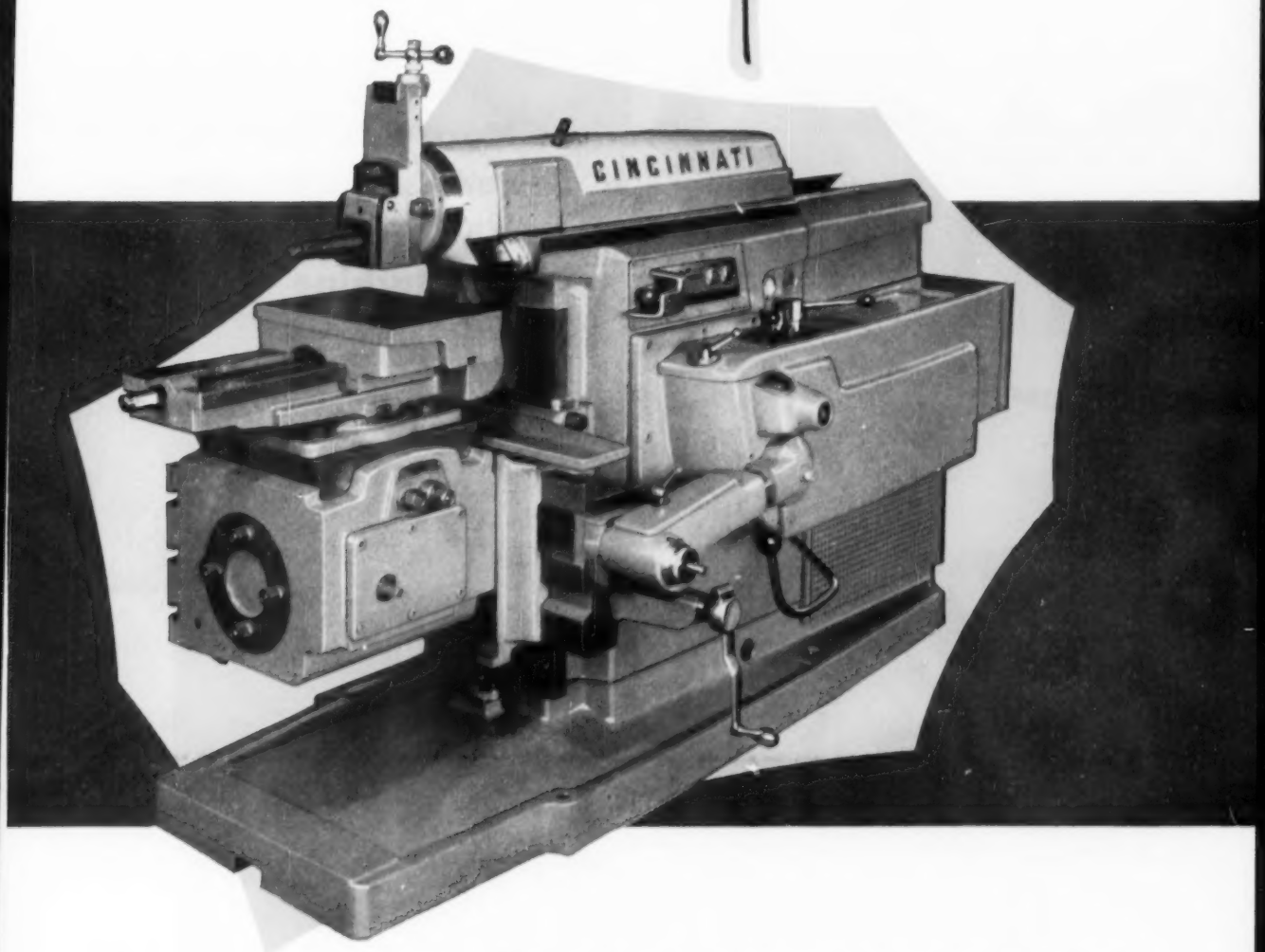
# New Cincinnati Rigid Shapers

New Look

**THE CINCINNATI SHAPER CO.**

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

# Accuracy...




/ / /

Very rigid and powerful—the New Cincinnati Rigid Shapers give a new accuracy—on heavy cuts and light cuts. They have the most rigid column and ram in shaper history. The Electro-magnetic clutch and brake and 50 PSI positive lubrication are exclusive features that give continued, efficient and accurate performance.

Write for bulletin on these new Cincinnati Rigid Shapers.

HARDINGE
ELMIRA, N.Y.

# *Variable Speed Machine*
*for*
# *PRODUCTION DEPARTMENTS*

**Produce More Precision Parts at Lower Cost with this NEW Second Operation Machine**

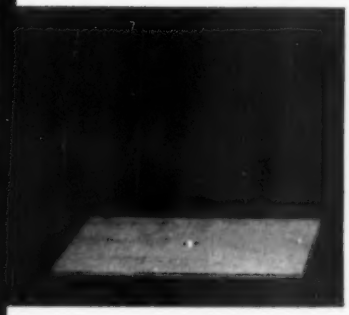
*Send for Free illustrated Bulletin DSM59*

**HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.**

# Why remove metal when you can move metal

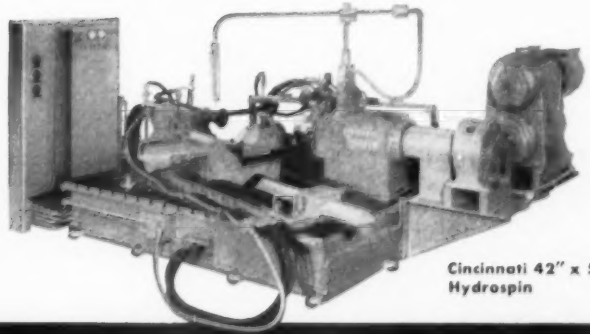
31" long

## into the shapes you want with the Cincinnati Hydrospin



14" high

A wide range of parts can be produced quickly and at low cost by "*chipless machining*" on the Cincinnati Hydrospin. Less metal is wasted and parts have accurate dimensions, high strength and good finish. Let a Process Machinery Division field engineer give you full details. For a description of the process and machine specifications, write for Bulletin M-1873-3.



Cincinnati 42" x 50" Hydrospin

Upper sequence of photos shows *one continuous* tube spinning operation. Starting blank, far left, of SAE 4130 is 8¾" long x 3" I.D. x 0.155" wall thickness. Finished part, shown at far right, Hydrospun in one pass, is 31" long x 3" I.D. with 0.030" wall thickness.

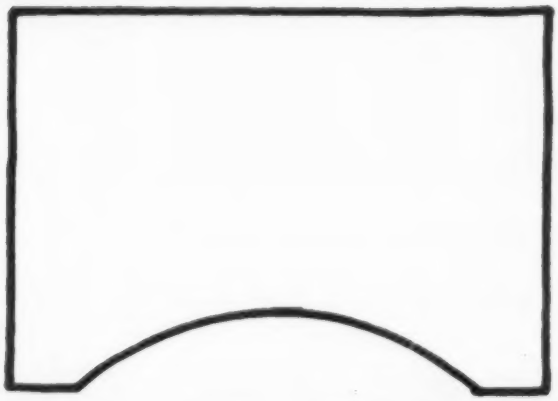
Lower sequence of photos shows *one continuous* shear spinning operation. Starting blank, far left, is of type 302 stainless steel, 12" square x ¼" thick. Finished part, shown at far right, Hydrospun to a 32° included angle in one pass, is 14" high with 0.069" wall thickness.

CINCINNATI **Hydrospin**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

# DROODLES

by ROGER PRICE



*Bench Model BC-7D*

*Floor Model FC-30*

*Floor Model FC-14*

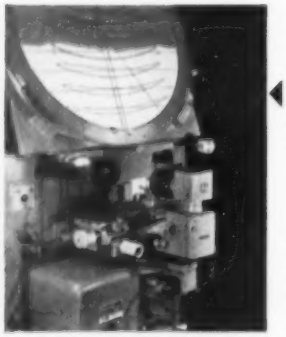
*Table Model TC-14*
*(Vertical Inspection)*

## "DRAWING BOARD FOR FAT DRAFTSMAN"

The "Comfy-Contour" drawing board was invented by my uncle Claude, an obese but brilliant man. He once had a fat commission to design new camel troughs for the Turkish government, and was rewarded with the honorary title of Emir Bey Windeau. Claude was very good-natured, and never beefed when we kids used his cummerbund for a pup tent. But, like all us talented people, he was sensitive, too. Like the time he thought his boss called him "clod". Claude up and belly-bunted him right over the office Coke machine. It wasn't a wise thing to do, but you had to admire his guts.

Another big development that wins admiration is the ever-increasing use of Jones & Lamson Optical Comparators. These precision-built instruments are being used throughout industry for measuring and inspecting all sorts of parts and objects. The J & L Comparator is accurate to .0001", and its versatility makes it equally suitable for both production-line and job-shop work. With a Jones & Lamson Comparator in your shop, you'll find you can perform inspections that just can't be done by other methods. Available in eleven bench and pedestal models. For complete information, write Dept. 710 *today*.

## JONES & LAMSON OPTICAL COMPARATORS *On the Job...*



**Checking gages to close tolerances at Winslow Mfg. Co., Cleveland, Ohio**

Templates used for manufacturing process are checked to tolerances of .0002". Standard Guillotine gages are duplicated from these "masters", for use by leading jet-engine makers in checking airfoils.

**Multiple inspections at a glance at Zagora Gears, Inc., Charlotte, N. C.**

Large capacity and ease of operation allow the inspection of oil grooves, shoulder lengths, several diameters; lead, pitch diameter and thread angle of thread and worm on these precision gear shafts *in one simple operation.*

# JONES & LAMSON

*World's Largest Manufacturer of Optical Comparators since 1919*

JONES & LAMSON MACHINE COMPANY, 502 Clinton St., Springfield, Vt., U.S.A.

OPTICAL COMPARATOR DIV.

# THEY WOULDN'T BELIEVE IT

# —until they SAW it!

Seeing was believing for a group of mechanical officials from one of the mid-west's most prominent earth moving equipment builders.

Frankly they just wouldn't believe that the new 32" "AMERICAN" Pacemaker Lathe would effectively use 60 horse power and cemented carbide cutting tools in machining rough alloy steel forgings. So they came to see for themselves and they saw:

1. Cuts 1⅛" deep.
2. Cutting speed 300 feet per minute.
3. .030" feed.
4. 60 to 65 horse power registered by horse power meter during the maximum cuts.
5. Not a shimmy or whimper from the machine.

***They were amazed and convinced.***

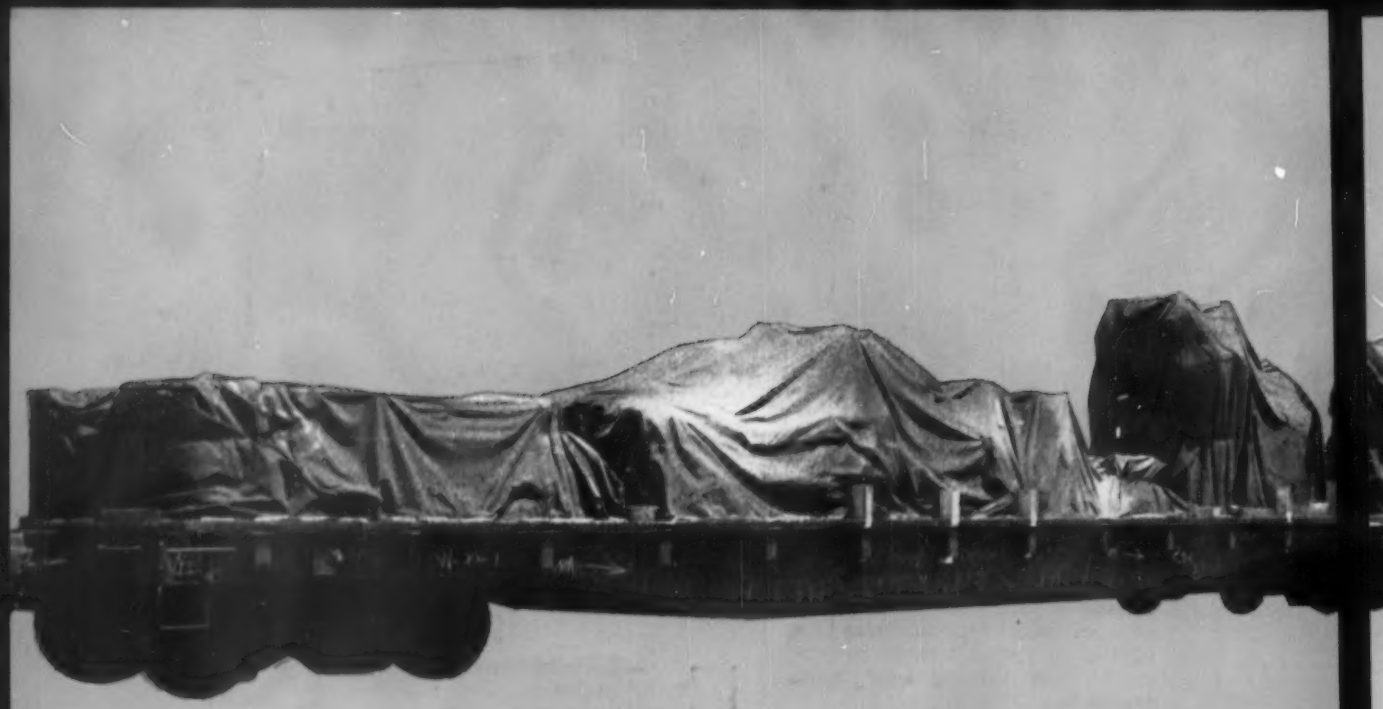
This new model Pacemaker is endowed with the power, stamina and convenience that combine to produce a thoroughly dependable and highly productive unit.

Bulletin No. 44 tells all . . . have one?

**THE AMERICAN TOOL WORKS CO.** Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

# Another Natco®



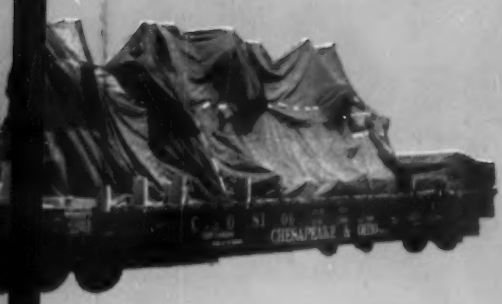
Delivery schedules of capital goods such as large, high-production machines present problems for machine tool builders. At Natco these problems are as serious as with any builder. But Natco's current record for on-time shipment is remarkably good . . . 86% either on schedule or better than schedule.

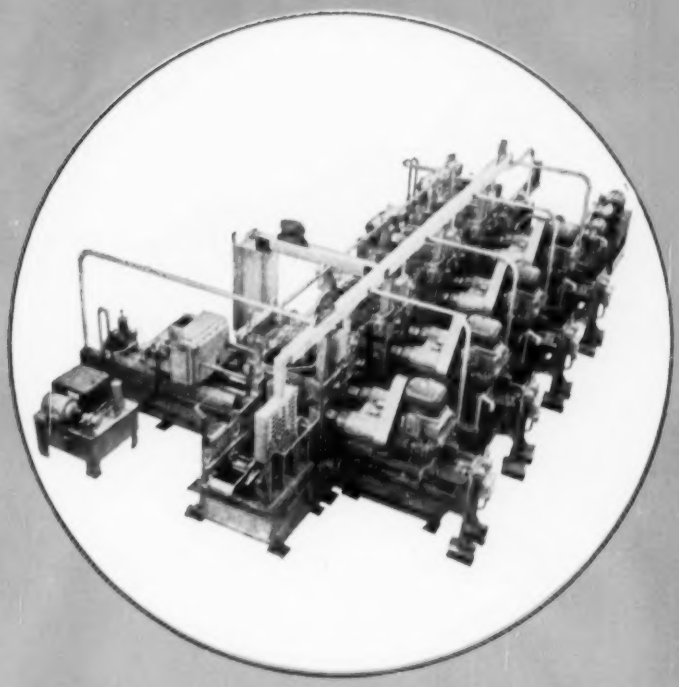
And we're not stopping there . . . we are adding 50% more production capacity to further improve our delivery schedules.

Production schedules of consumer products also present serious problems. With modern, high-production, cost-saving machine tools, many perplexing production schedules become routine.

Call in a Natco Field Engineer to discuss your next production problem. You can count on his recommendations *and* his delivery promises.

# Shipped on Time





Multiple spindle drilling, boring, facing and tapping machines.
Special way-type, index and transfer machines.

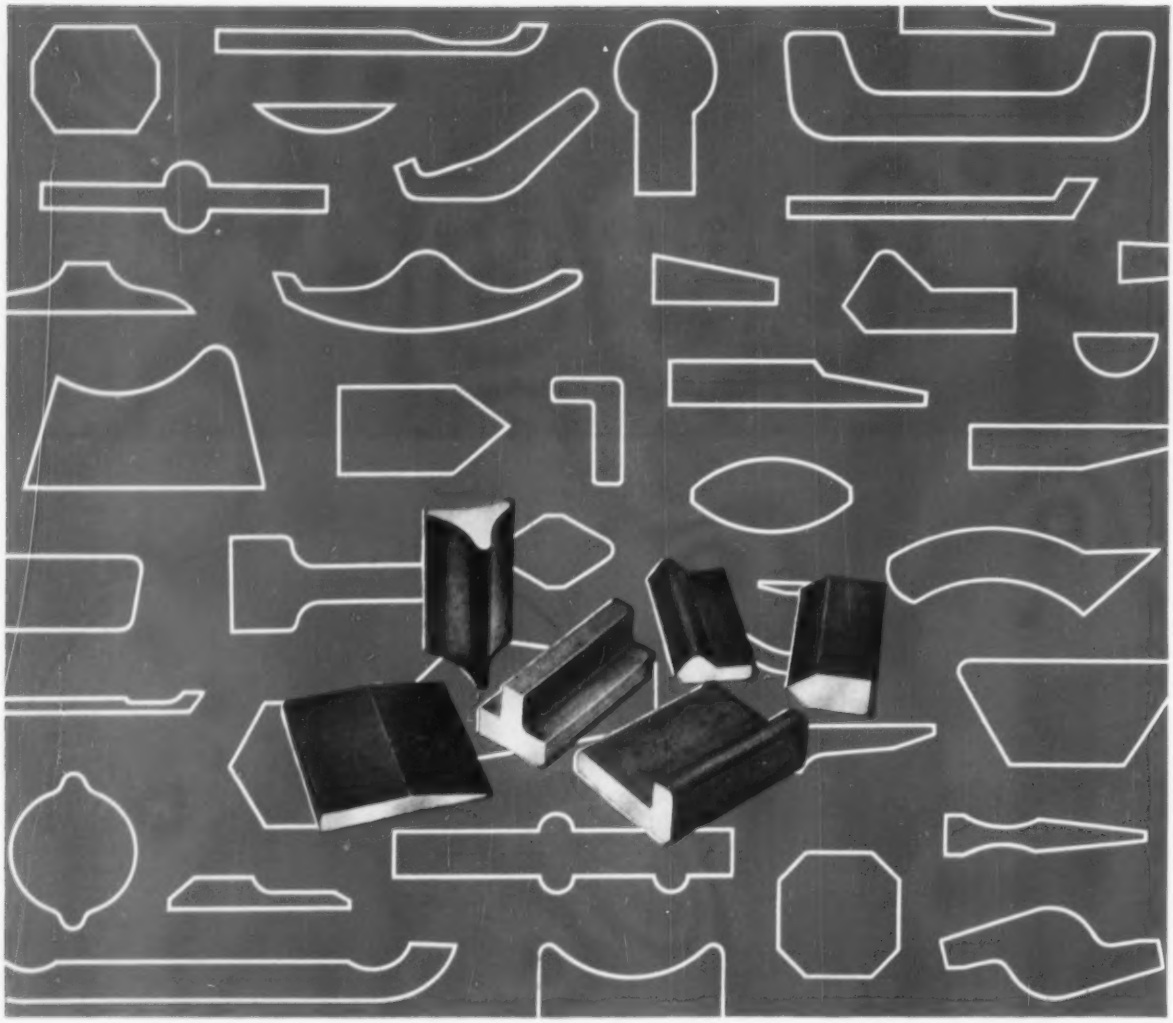
Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

*Natco Holeway® transfer machine turns and faces 120 cylinder blocks per hour.*

**NATIONAL AUTOMATIC TOOL COMPANY, INC.** ***Richmond, Indiana***

NATCO

*Ask for information about the PAYD (Pay-As-You-Depreciate) Finance Plan.*



# Crucible special shapes

*for better alloy steel parts at lower cost . . .*

If you're machining intricate sections from solid bars—or using expensive forgings—stop! Choose instead, a *Crucible special shape* that approximates the finished part. *Crucible special shapes* eliminate rough-machining operations . . . reduce scrap losses.

There's practically no limit to the *special shapes* available at Crucible, in a wide variety of alloy steels. Rolls for over 400 special shapes are available—other shapes can be rolled to your specifications. Your local Crucible representative can give you the whole story of how *special shapes* can cut costs—save time. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

*Mr. Frank Meyer, Chief Engineer of the Taft-Peirce Instrument Gage Department, tells you about . . .*

# 6 Special Ways to Air Gage for Lower Costs, Higher Production

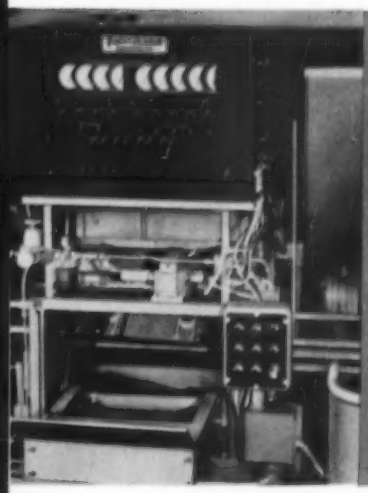
In today's cost-conscious production, control of size and dimension must literally be *built-in* to the manufacturing process — *before* out-of-tolerance parts or components get to assembly. Speed and accuracy of in-process inspection operations are vital.

This is a job for Taft-Peirce CompAIRamatic air gaging. The air-electric principle is ideal for "feeding back" information to automatic or semi-automatic machine tools. A large number of dimensions can be gaged simultaneously, and it is possible to check many thousands of parts per hour.

But Taft-Peirce feels that the potential benefits of air gaging have barely been realized. Here are just a few of the more interesting jobs that Taft-Peirce Air Gaging is already handling — see what improvements in production and quality control they suggest to you.

**TAKE IT TO TAFT-PEIRCE**

means TOP precision



# TAFT-PEIRCE CompAIRamatic Checks 4 Dimensions, 5 Locations on 13-Station Transfer Machine

This T-P CompAIRamatic checks locations and widths of the main bearing of automotive cylinder blocks, after milling operations. The 9 dials and lights you see in the inset indicate five bearing locations and four dimensions at the same time. When any location or width is out of tolerance, the unit automatically stops the machine, gives a light indication of which dimension is off-size and a dial indication of exact size. It is engineered into a 13-station transfer machine that performs milling, drilling, and reaming operations on V-8 engine blocks.

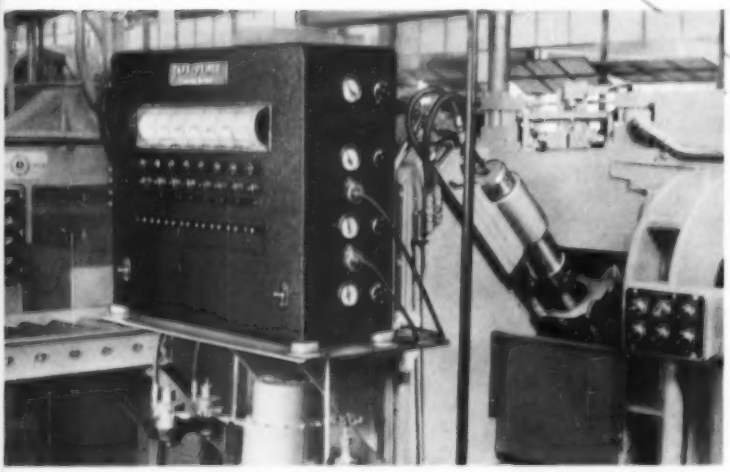
## *Special Features make* **T-P CompAIRamatics** *sensitive, very simple to apply*

The CompAIRamatic has the sensitivity and simplicity needed to work with automatic and semi-automatic machine tools:

**1** A sensitive diaphragm converts air flow to electrical impulse with the basic simplicity and accuracy found in standard air circuits. All dimensions can be assimilated, so that a single master light or signal will indicate complete adherence to tolerance specifications.

**2** T-P contact type gaging members have greatly broadened the scope of air gaging, particularly on rough surfaces. Reed-mounted contact "buttons" — in conjunction with standard air circuits — engage the part surface for measurement. Accurate readings over surfaces with a finish of 100 to 150 microinches, rms, are possible. Contact type members can gage tolerances as narrow as .0001″, or can be designed to check as wide a range as .125″.

T-P CompAIRamatics are single purpose and can be designed to solve specific problems.

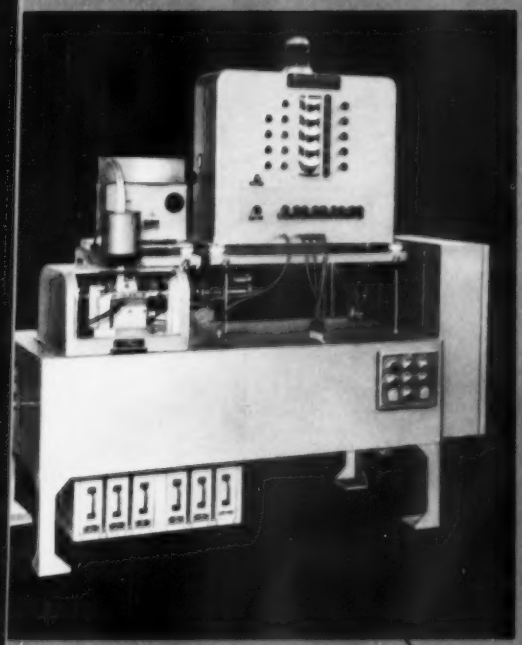


## CompAIRamatic Gages Cylinder Bores

Another T-P air-electric gaging unit is installed in a multi-station transfer machine to check diameters in automotive engine blocks as they come from boring operations. It uses contact-type plugs, automatically gaging the entire length of 8 bores at the same time. Out of tolerance shows by light, and line shuts down. Tolerance is .004″.

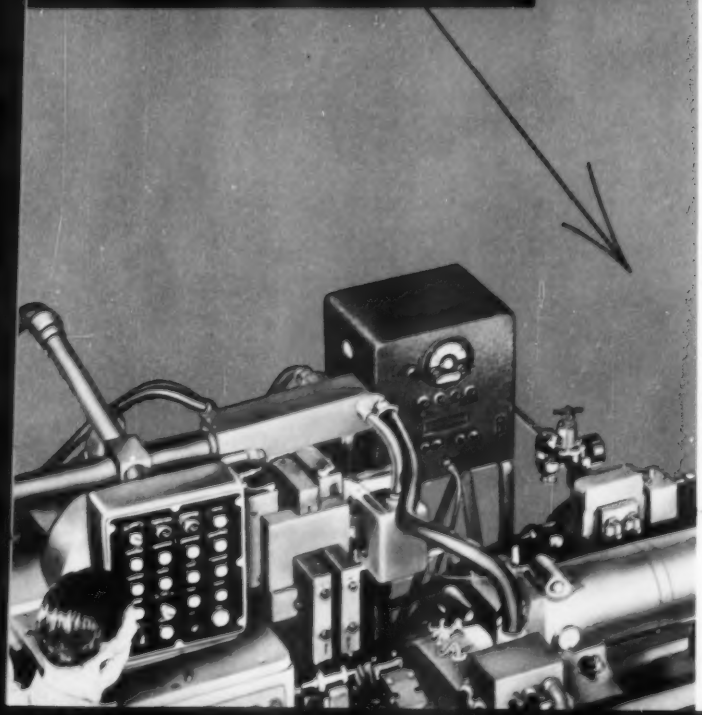
## Air-Electric CompAIRamatic Separates Sizes, Cuts Rejects

Taft-Peirce air gaging frequently goes far beyond pure inspection. This CompAIRamatic Sorting Machine automatically checks carriage rolls for electric typewriters, and sorts them into three size categories: over-size, undersize, and within tolerance. Parts are centerless ground, fed into a vibratory elevator and automatically chuted to the gaging head. Two circuits check OD and roundness at a minimum rate of 1000 parts per hour. Since CompAIRamatic has been installed, about two million parts have been processed. Rejects at final assembly have dropped from 80 to 5 a day, and trouble spots in manufacture have been cleared up — with an overall cost reduction . . . all as a result of T-P engineered air gaging.



## 2000 Parts Per Hour Go Through Five-Dimension Sorting Machine

High-speed inspection of small parts and components is a natural for Taft-Peirce CompAIRamatic. This sorting machine gages the pump vanes for automobile power steering units at a rate of 2000 parts per hour, separating them into six different categories: in tolerance and out of tolerance for two points of thickness, two points of width, and length. Everything is automatic, from the time the parts go into the vibratory feeder until they are received in the six bins. Appropriate signal lights and dials on the control panel give conatant visual indication of dimensions as parts are gaged and sorted.



## Automatic Size Control Uses "Feedback" Signals to Keep Parts in Tolerance

This Taft-Peirce CompAIRamatic is an air-electric unit installed on an automatic (self-resetting) lathe. As the part being machined approaches tolerance limits, the T-P gaging unit sends impulses to the lathe controls, calling for the cutting tool to be moved forward or back. If tool does not advance or retract, or is too worn to compensate correctly, the CompAIRamatic shuts down the machine.

The combination of automatic lathe and T-P CompAIRamatic enables the manufacturer to continuously keep size of parts within an optimum range. Result: Far fewer rejects, much lower unit cost and increased production.

**THERE'S MORE, TOO**

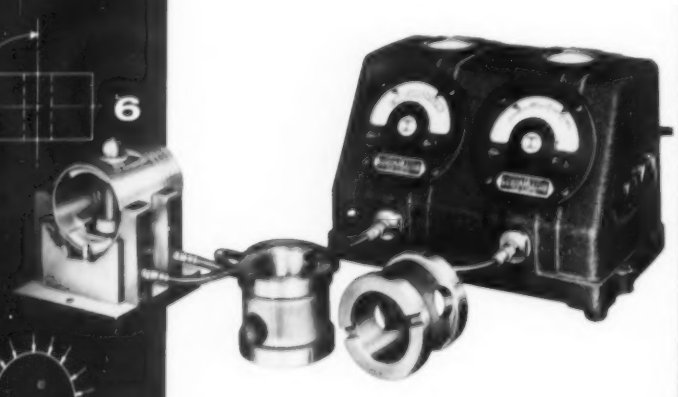
*. . . check the next page for other ideas*

## More Precise Grinding with Semi-automatic Size Control

A Taft-Peirce CompAIRator provides a big assist to hand grinding by giving the operator a continuous and highly accurate visual check on stock removal. Specially designed gaging heads can be furnished to measure all types of parts; and, where required, the standard dial can be supplemented by signals and "feedback" devices.

## Many Jobs for Semi-automatic Gaging

There are thousands of applications for Taft-Peirce semi-automatic gaging, all designed to increase precision and speed of inspection operations. Some of the more popular (shown at left) include: **(1)** checking of bearing liner thickness, **(2)** helical groove diameter, **(3)** outside and inside diameter, **(4)** center distance, **(5)** concentricity, **(6)** squareness, **(7)** ovality, **(8)** serrations, and **(9)** taper and diameter. Frequently many of these checks can be combined into a single gaging operation; and Taft-Peirce can engineer them into automatic or high production lines. Gaging fixtures and head arrangements will handle virtually every shape.



## How to Put This Advanced TAFT-PEIRCE Air Gaging to Work . . .

The *complete* line of Taft-Peirce CompAIRators and CompAIRamatics gives you a unique single source for solving all gaging problems. And Management accent on costs and product performance make it doubly important that you get the benefit of industry's most advanced thinking. Use this broad T-P experience — from the type of jobs you've seen represented here and from their long history of problem-solving for America's leading manufacturers — to help you.

Take the first step by contacting one of these Taft-Peirce representatives; or contact the home office. Our facilities will be available to you.

### DISTRICT SALES OFFICES

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35 Hollymount Drive
*Telephone:* Congress 1674

**Chicago, Illinois**
5807 West Division Street
*Telephone:* Columbus 1-6667

**Los Angeles, California**
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*Telephone:* Ludlow 8-6231

**New York City**
5301 Woolworth Building
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**Detroit, Michigan**
10243 Puritan Avenue
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**THERE'S A SPECIAL AIR GAGE BULLETIN FOR YOU, TOO!**

If you'd like catalog and case history data on Taft-Peirce CompAIRamatics and CompAIRators, please write or call for Catalog No. 613. And we'll keep you on our list to receive free Product Data sheets as new and cost-saving developments come along.

## TAKE IT TO TAFT-PEIRCE

**THE TAFT-PEIRCE MANUFACTURING CO.**
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*Telephone:* Poplar 2-1000

means TOP precision

1000
~~400~~ sfpm

depth of cut-~~.005~~ 125

sfpm-~~800~~ 1250

~~un~~machinable"

~~250~~ 2000 sfpm

pieces per hr.-~~20~~ 65

SAE 1035-~~250~~ 1175 sfpm

HS-Steel-~~90~~ 505 sfpm

min. per cut-~~40~~ 4

***you can scrap your ideas of cutting-tool performance . . .***

# STUPALOX

## *introduces a* NEW ERA!

The figures above show the amazing improvements in production obtained through the use of STUPALOX sintered oxide cutting tools in place of tools previously used. Actually the figures are conservative, because tool performance in many cases was limited by inadequate power and rigidity of the machine tool.

Stupalox Tools are available now in commercial quantities, and a variety of styles and sizes of inserts. Write for complete data.

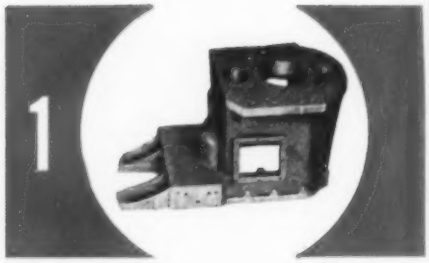
**HANDY PACKAGE** — *contains ten inserts*

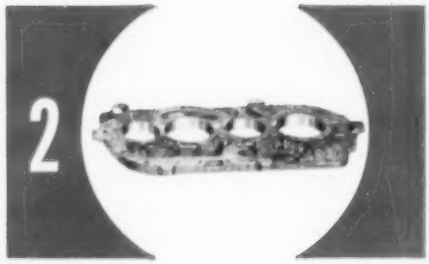
This compact plastic box provides a practical container for ten Stupalox sintered oxide inserts.

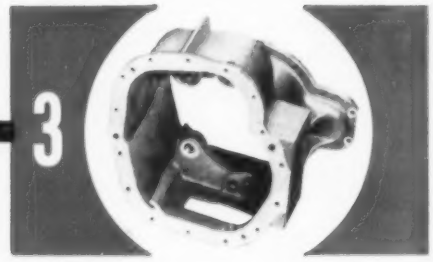
**Stupakoff**
DIVISION OF
**The CARBORUNDUM Company**

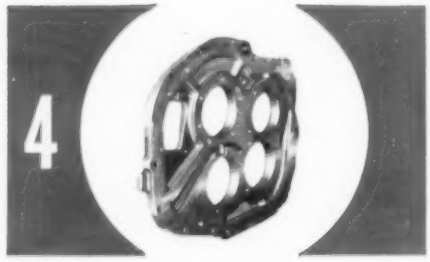
*Write Dept. AM*
LATROBE, PENNSYLVANIA

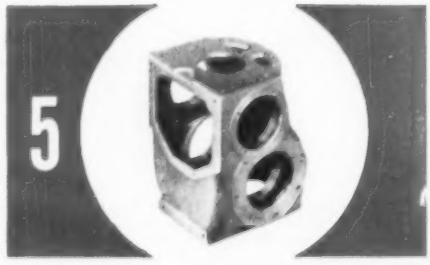
# 5 DIFFERENT WORKPIECES PROCESSED ON ONE W. F. & JOHN BARNES SPECIAL MACHINE




## Versatile Tooling and Special Machine Precision Lower Costs, Improve Quality of Motor Grader Transmissions

This W. F. & John Barnes unit, designed and built for the J. D. Adams Manufacturing Co., Indianapolis, Ind., combines all the built-in advantages of a special machine . . . yet it machines not one, but FIVE separate and dissimilar workpieces that together form a complete transmission housing. Ingenious planning of spindle arrangement, tooling, and fixtures enables only 31 spindles to perform a total of 53 operations on the five workpieces. Special fixtures and numbered gauges locate the work and tooling quickly and accurately . . . complete change-over from one housing section to another averages only six hours.

Engineering and building a distinctive machine like this just doesn't happen by accident . . . it's the result of over 75 years of accumulated knowledge in a highly specialized field. That's why at Barnes you'll find the creative skills, plus complete and adequate facilities, for designing and building better machines to lower your production costs . . . improve product quality.

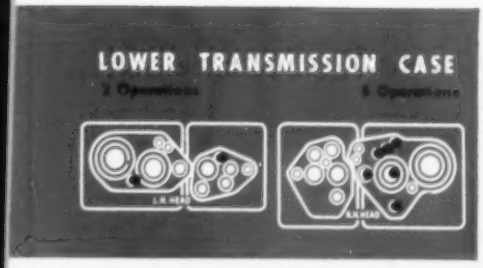
**ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS**

Find out how Barnes' unique creative and specialized resources can help you cut costs. Your problem will be given expert and individual attention.

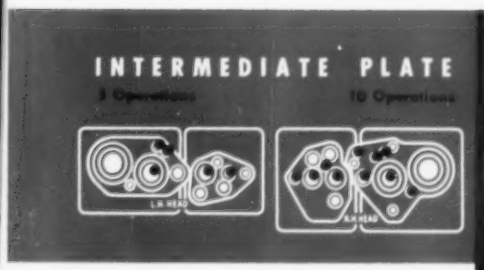
W. F. & JOHN BARNES

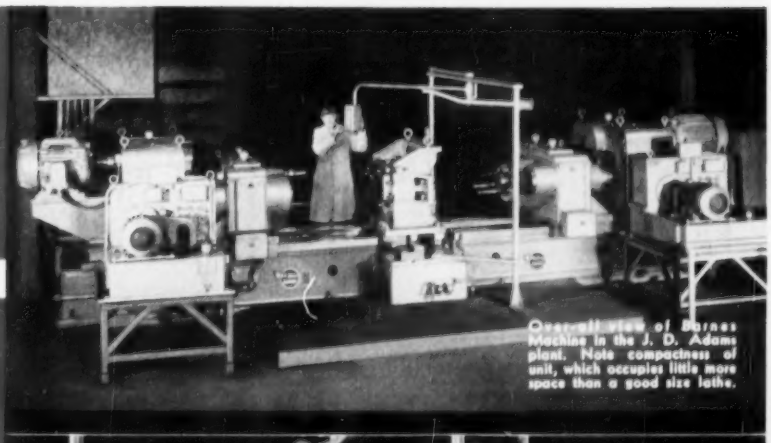
BUILDERS OF BETTER MACHINES SINCE 1879

MULTIPLE SPINDLE DRILLING • BORING • TAPPING

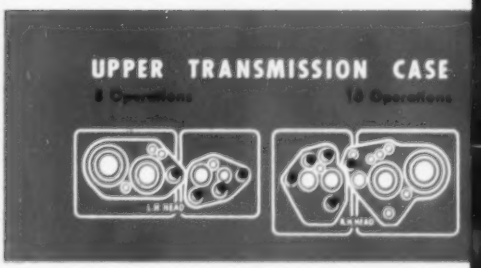



Drawings illustrate the spindle arrangement in the opposed heads and how they are individually tooled to perform chamfering, rough, semi-finish and finish boring, and facing operations in the five different workpieces. Two auxiliary heads mounted at right angles to the machine bore dowel holes in the Final Drive Housing.

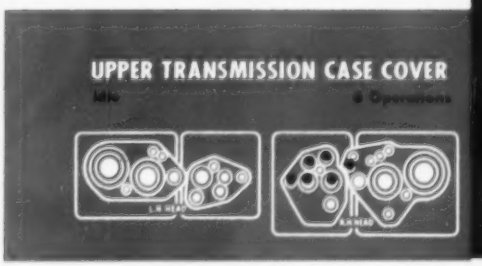


Overall view of Barnes Machine in the J. D. Adams plant. Note compactness of unit, which occupies little more space than a good size lathe.



Closeup of fixture used for Upper Transmission Case. Note rings for quick removal. Spindle housings are divided and gear boxes separated from housings to minimize heat rise.



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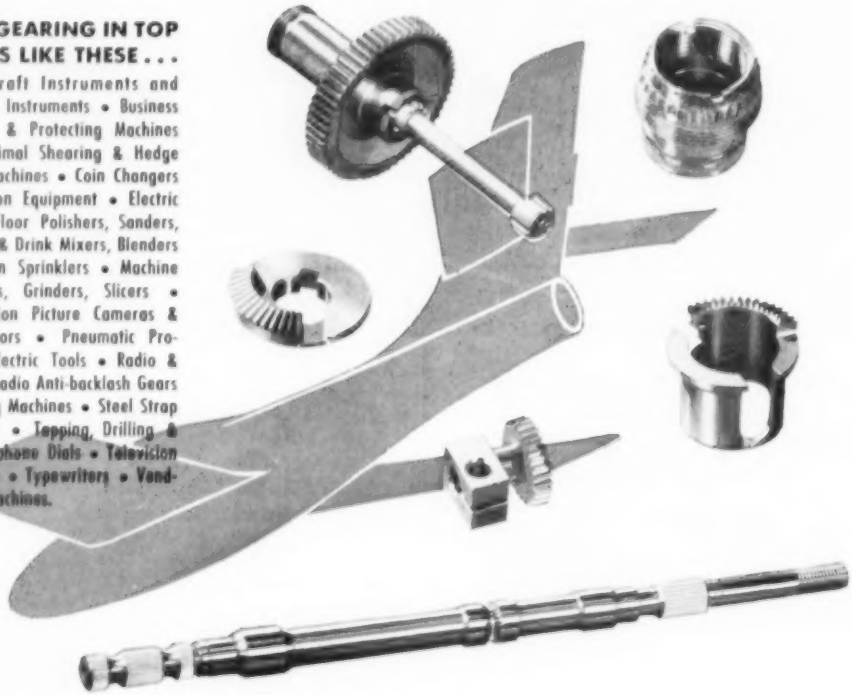

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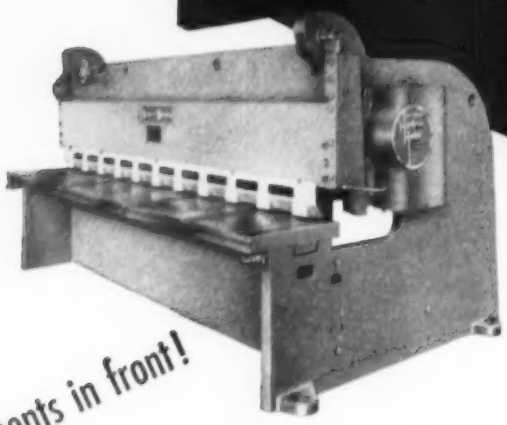
# Productioneered

## by Lodge & Shipley



...all adjustments in front!

...all clear in the back!

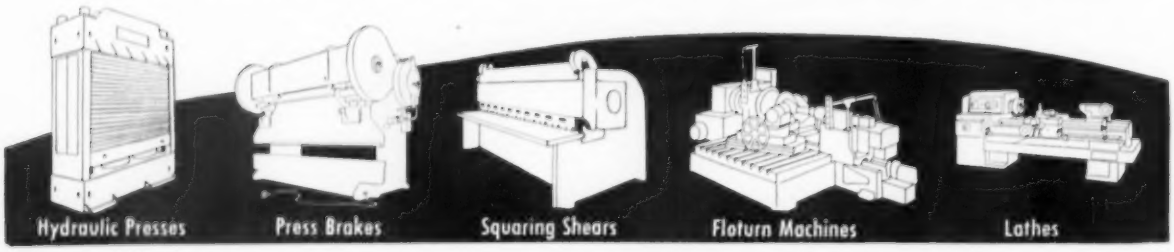
If you want a new standard of shearing performance . . . and lower costs too . . . investigate the proven features of the new Lodge & Shipley Squaring Shears. Engineered to production standards, these new shears represent more than 75 years of experience in development and refinement of metalworking equipment.

Many of the new and exclusive features combine to keep the operator in front of the machine and on top of his job. "Out front" adjustments and "all clear" design in back of the shear means that production can flow steadily at lowest cost!

New literature details the ease of operation, effortless accuracy and notable economy of Lodge & Shipley Shears. Write for your copy of Bulletin PS-9:

**The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.**

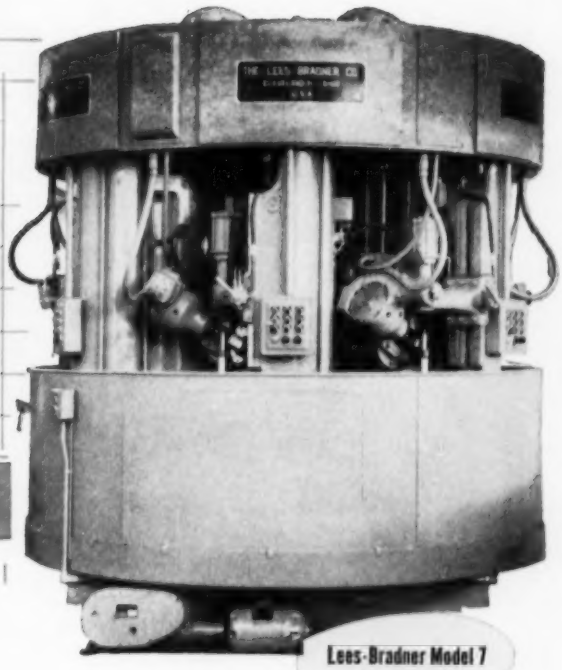
**Outstanding Lodge & Shipley Features . . .** Combination Air Clutch and Brake ● Long Life Gear Train ● Inclined Ram ● Air Ram Counterbalances ● Positive Lubrication ● Front Operated Back Gauge ● Positive, Safe Holddowns ● Forged One-Piece Eccentric Shafts ● Front Adjusted Ram Back Brace ● Front Adjusted Blade Clearance and Indicator



LEES-BRADNER

# Sets the HOBBING pace for tomorrow

## with 6 machines in 1



**Lees-Bradner Model 7 HD 8" x 20" 6-Spindle Rotary Hobber. Also available in single and 4-spindle models.**

Here's a complete hobbing production line in one space-saving unit. Actually the Lees-Bradner Model 7, HD 6-Spindle Hobber is six separate and independently operative machines in one. Each hobbing unit incorporates basically the same automatic, high-production features as the remarkable 7 HD Single Spindle Hobber. This includes a heavier, more rugged headstock, heavy-duty column and a 10 H. P. motor.

This amazingly efficient machine not only saves valuable floor space but, with its pushbutton controls and automatic features, actually controls the operator thus reducing the chance for human error or slowdown. Chips and coolant are easily carried away from the headstock by the elimination of flat surfaces.

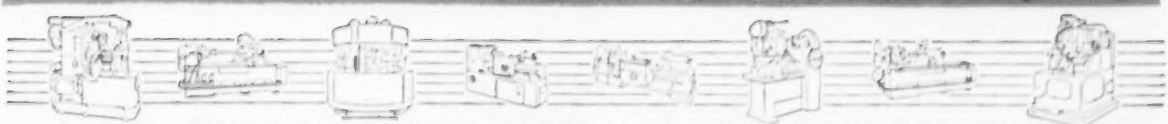
So, if your manufacturing space is valuable and high unit production important, ask your Lees-Bradner representative to give you the story on the ultra-efficient 6-spindle rotary hobber. Write or wire us direct for his name and address in your area.

*View of new HD headstock with increased bearing surface between column and headstock, heavier casting, coolant and chip carry-away.*

**8-Spindle 7-A Rotary Hobbers also available.**

# the LEES-BRADNER Company

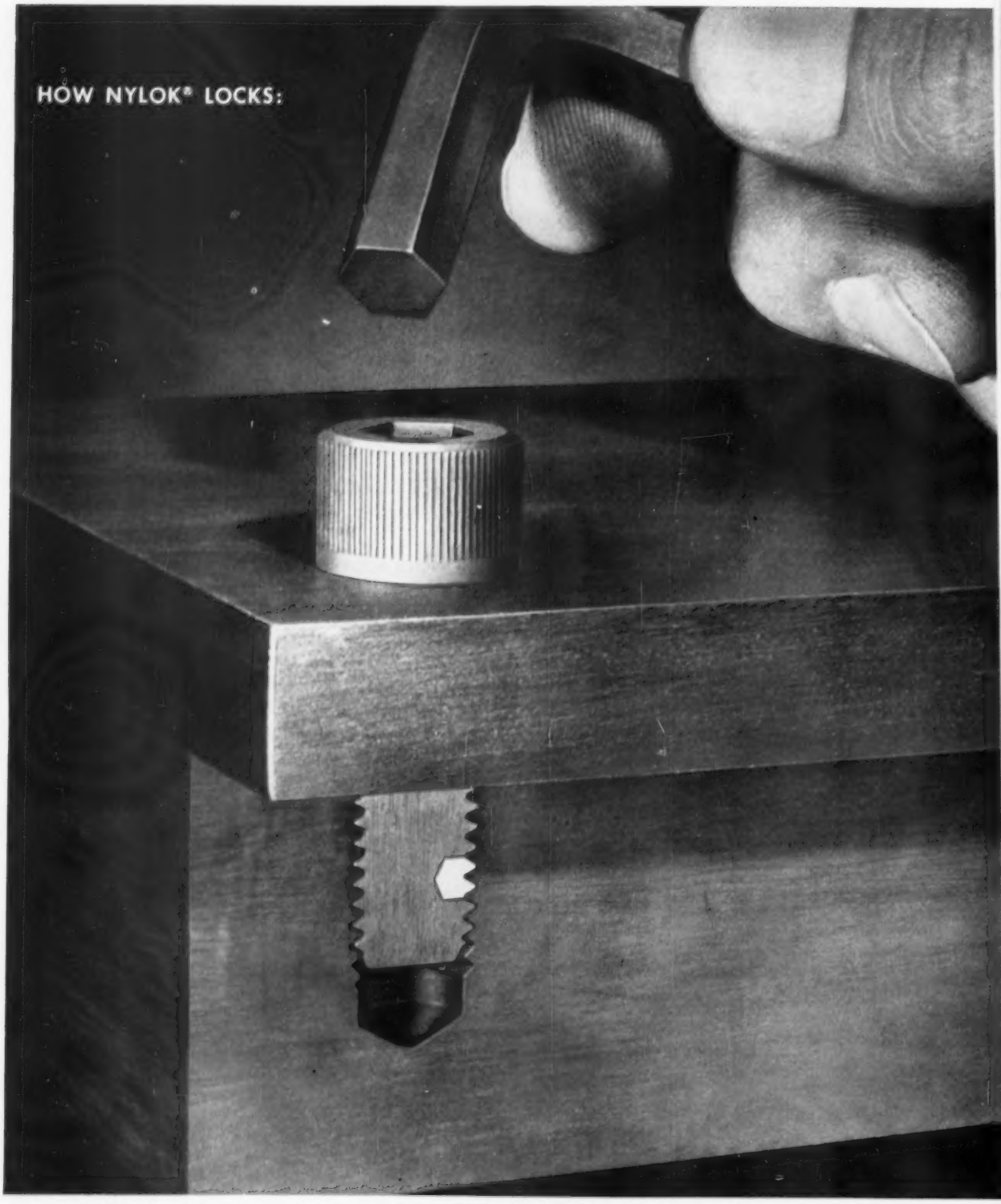
**CLEVELAND 11, OHIO, U.S.A.**



MODEL 8 HOBBER · HT THREAD MILLER · 7-HD ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · 5H SPLINE HOBBER · 12-S HOBBER

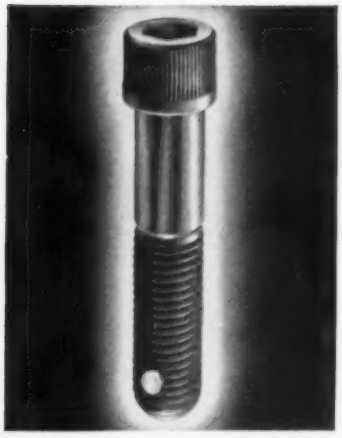
IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

# NEW—self-locking UNBRAKO

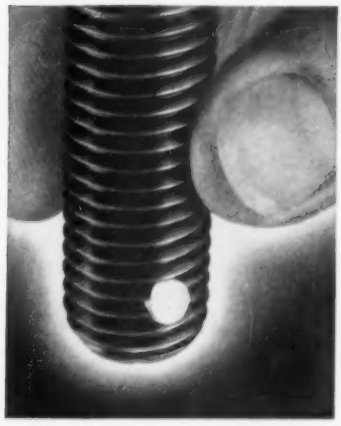



**LOCKED!** The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together and locks the screw securely.

# socket head cap screws



Self-locking UNBRAKO socket head cap screw.



**BEFORE ASSEMBLY.** The nylon pellet projects slightly. When assembled, threads will be impressed into it.

**AFTER REMOVAL.** "Plastic memory" of pellet has expanded impressed threads to greater diameter than screw threads. Screw can be used repeatedly. In use, "memory" keeps threads tightly locked.

**They won't work loose. And they simplify design and save production time.**

UNBRAKO socket head cap screws are now available embodying the Nylok* self-locking principle. Nylok provides the first truly practical solution to the problem of making cap screws self-locking.

An UNBRAKO cap screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not work loose.

You save production time when you make products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. And in many cases you will save weight and mass by using shorter screws in tapped holes instead of drilling through and using nuts and lockwashers.

Self-locking UNBRAKOS are reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, when screws are properly seated, the locking pellet also functions as a liquid seal.

A complete line of self-locking UNBRAKO socket screw products, in a wide range of standard sizes, materials and finishes, is available through your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation*

UNBRAKO SOCKET SCREW DIVISION

**STANDARD PRESSED STEEL CO.**

**SPS**

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Highest Precision
DRILL &
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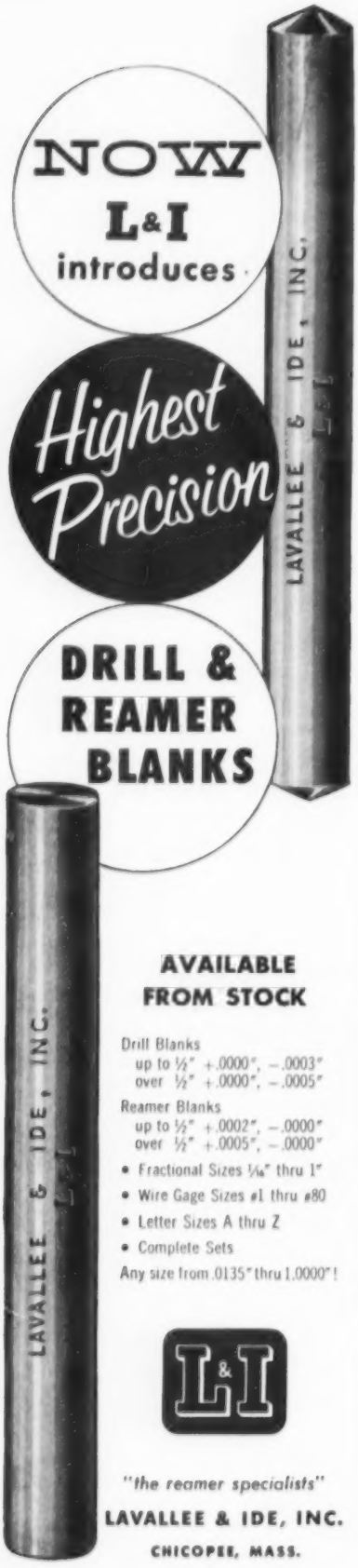


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# Letters ...

To American Machinist
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## Building Blocks Will Come

In spite of considerable, and perhaps largely justified opposition, I feel confident that a substantial degree of standardization of mounting dimensions of packaged units for transfer equipment will undoubtedly be achieved. If I thought that the current furor over automation were a passing fancy, I would perhaps not hold this view, but as automation is merely one more step of progress in the tooling process, anything that has already been accomplished in this direction will doubtless be with us permanently. Obviously, however, the "building block concept" is not an answer to all our problems, but neither is it supposed to be. Frequently, opposition to things of this sort is generated on the basis that there are many things that will not be accomplished by it, those in opposition closing their eyes to the many things that it will do. Just as the simplest and most basic machine tool has its place (witness Bridgeport Miller) without eliminating the need or desirability of highly complex, special-purpose, fully automatic machines, so it is true that the "building block" approach need not be thought of as something which will eliminate all else.

It strikes me that standardization can best be achieved through following normal ASA procedures. This would probably mean establishment of one or more standards committees under the National Machine Tool Builders' Association, working through the ASME. The job would be a long and difficult one, but results would be obtained eventually.

Name withheld

## As I Was Saying

Mr English makes a good point in his letter (*AM*—Aug 27 '56, p68) but it is actually a point in my favor. Having used all available edges on his disposable tip, for both right- and left-hand cuts, he does not throw it away, as is now being recommended. Instead, he brazes it to a

### SHOPMATES

WOW!!! LOOK AT THIS THING SHINE!
CLANCY SPENDS TWO WEEKS POLISHIN' THAT VALVE AND THAT GUY HAS MESSED IT UP IN TWO SECONDS. NOW CLANCE HAS ANOTHER WEEK'S WORK TO CLEAN IT UP AGAIN.
CLANCE IS GITTIN' SET TO POLISH OFF A HEAD— DUCK! YER IN THE LINE OF FIRE!
HANDS OFF
N. JARVIS

# Why Sterling adds a sixth element to your grinding wheel formula

YOUR GRINDING WHEEL'S performance is determined by the five elements that make up its specification: abrasive grain, size, grade, structure, and bond. But in determining the precise formulation of these five elements, Sterling always considers a *sixth* element.

**The sixth element** is the *human* element: the operator himself, his work habits, personal preferences, and all the other little things that make your job unique. Considering the vital sixth element may mean the difference between success and failure on any grinding operation.

**Sterling grinding wheels**—formulated with the sixth element in mind—can cut your grinding costs, reduce grinding time, and get maximum production from your machines. That's why it's sound practice to call in a Sterling Abrasive Engineer, or your nearest Sterling Distributor, for a complete study of your grinding operation. Do it soon.

Sharpening tools and cutters like this milling cutter is cooler, easier with Sterling vitrified cup wheels.

"Wheels of Industry"—Vitrified and Resinoid —to meet the exact requirements of industry.

# STERLING GRINDING WHEELS

STERLING GRINDING WHEEL COMPANY, TIFFIN, OHIO—SUBSIDIARY OF ABRASIVE AND METAL PRODUCTS COMPANY

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

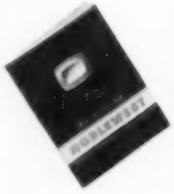
# ROLL-O-MARK

**MULTI-PURPOSE ALL-PNEUMATIC MARKING MACHINE**

1 *Roll-Marking into Surface of Piston*
2 *Serial Numbering into Metal Shaft*
3 *Permanent Marking and Graduating into Metal Collar*

*Model 50P1*

NOBLEWEST ROLL-O-MARK . . . with all pneumatic operation . . . is the most versatile and widely used general purpose machine for permanently marking round or flat surfaces, automatic serial numbering and precision graduating. For many applications it is by far the best investment in all factors of performance, versatility, reasonable cost and quick delivery. For marking speeds up to 1500 pieces per hour this model can be supplied with the exclusive Noblewest *Cyclomatic Control* for automatic operation at any desired speed. Air ejectors, automatic hoppers and dial feeds are also available. Series 50 general purpose marking machines can also be supplied in manual and semi-pneumatically operated models and heavy duty models. For comprehensive information on all Series 50 models and other marking equipment write for our new catalog. Just send your name and title on company letterhead. Remember Noblewest engineering service is always available on marking problems.



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**MARKING MACHINES • MARKING TOOLS**

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steel shank and makes another serviceable tool out of it. That's just the point I was trying to make. There is still a lot of good usable carbide left and it is a shame to throw it away.

R C Timmons
Cleveland

## Springback Control

Of particular interest to us was the item on "Spring-Back Control" by Don R King (*AM*—June 6 '55 p 173), because the control of springback has been the cause of more press and press brake overloads than any other single thing. The article is very comprehensive and the only one which realistically approaches the problem.

However, in spite of the fact that he gives it a very light treatment, spanking the bend, in our opinion, could be even further de-emphasized and the disastrous effects could be brought out even more strongly. The inference is that some results can be obtained by using a method shown on page 173, Fig 2. Although he points out that abnormally high pressures can occur, I would like to see him emphasize the point that nothing actually happens until the pressure on the piece being formed reaches 100 tons per sq in. for mild steel (point at which metal flows), and even then springback occurs to a limited degree.

If you will examine the conventional stress-strain curve of steel, you can appreciate this, because as the stress applied passes the elastic limit, the deformation accomplished will return along a line parallel to the original curve, displaced to the right by an amount proportional to that by which the elastic limit has been exceeded. We continually find that pressroom operators and supervision do not appreciate that forming steel or other metal is directly related to the stress-strain curve, although most of them know this physical characteristic.

For some reason, they seem to feel that a press or a press brake can be used like a hammer but, in so doing, ignore the areas of metal under pressure. Actually, the problem of overloading becomes even worse as the thickness of metal decreases, because the flow pressure increases as the ratio of metal thickness to area under pressure decreases.

Another suggestion we would like to make is that, while Fig. 3b shows a spring-pad type of die, further improvement of press operation can be

obtained if the bottom face of the punch is further relieved, to allow space between the work and the punch.

Name withheld

## Titanium in Color

Congratulations on the very fine format. The 4-color production sequence (*AM*—Jul 16 '56, p133-140) was the finest I've ever seen. I hope to see more of them in your fine publication.

Eugene Chartrand
Anaheim, Calif

. . . received twice as much from colored pictures. . .

Glen Rhodes
Jackson, Miss

. . . series of colored pictures make the article much more impressive. . .

R E Brown
Stratford, Conn

Colored pictures as a whole are more eye catching . . . but if a person is interested in the article he would not care whether the pictures were colored or not.

Thomas Hampton
East Pittsburgh, Pa

If you keep your articles interesting, I will read them—color or no color.

Richard Baverstock
Lynnwood, Calif

I like the color pages, but because of the expense no doubt involved, feel that the additional research work that it could be used for would be of more real value to the most readers.

S W Young
Portland, Ore

Beautiful—in this case worth the cost. . .

J F Stokes
Corpus Christi, Tex

. . . proves the old story that "a picture tells more than a thousand words."

J F Vekasy
Beaver Falls, Pa

How can you beat pictures in color?

A Loucony
Bridgeport, Conn


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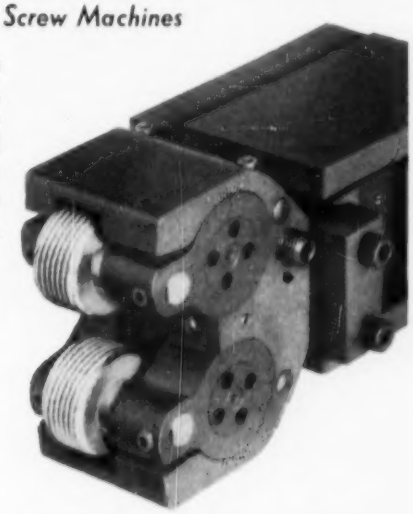

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- Dovetail clamping arrangement simplifies setup by permitting head to be removed from adapter

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|---|---|---|---|
| B 10 | 0-5/8" | 7 | 80 |
| B 13 | 1/8"-13/16" | 9 | 90 |
| B 18 | 1/4"-1 1/8" | 15 | 105 |
| B 36 | 3/8"-2 1/4" | 18 | 185 |

*Straight and Taper Pipe Threads, including Dryseal (NPTF). Change may be made from Straight to Taper Threading by changing rolls only. No other equipment is necessary.

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REED SERVICE PERSONNEL AVAILABLE to assist with initial installation. Application and Operating Instruction Book supplied with each attachment. Complete satisfaction assured.

*Write for Attachment Bulletin B-1*

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Two new Starrett micrometers make miking odd-fluted cutting tools a routine shop measurement instead of a time-consuming operation. Specifically designed for measuring odd-fluted taps, end mills, reamers, counterbores, etc., No. 483 (for 3-fluted tools) and No. 485 (for 5-fluted tools) are used like any conventional outside micrometer and read direct in thousandths.

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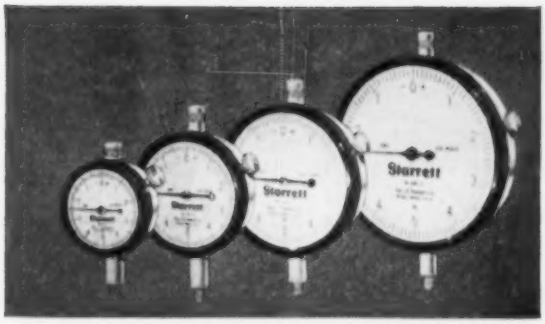
No. 220 is now available in 0-1″ and 1-2″ sizes. Vise-type frame holds round or double-ended flat anvil (furnished) — also special anvils. With vise jaw removed, also serves as height gage.

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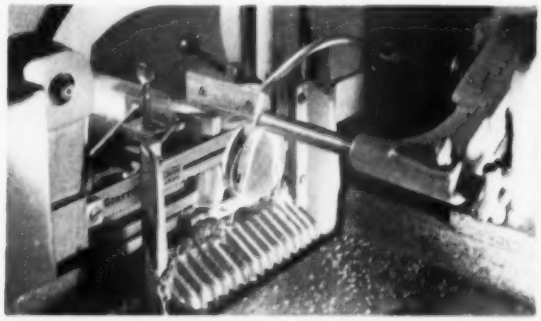

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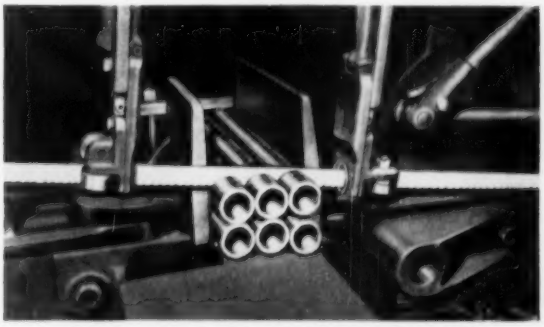
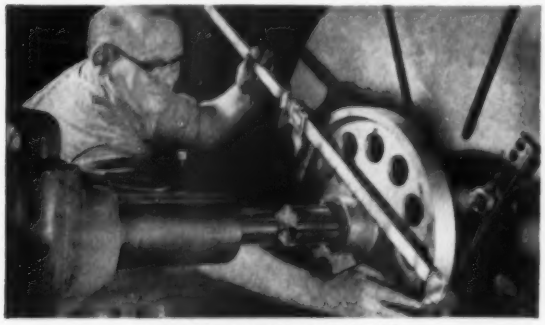
New Starrett Hacksaws are Color Identified for quick selection and Production-Proved to give you the performance you need for any metal cutting job. Starrett also makes new Safe-Flex® Hole Saws in a wide range of sizes for cutting clean, round holes in any machineable material.



**NEW PRODUCTION-PROVED BAND SAWS**

Now production-proved to give faster cutting, longer blade life. Starrett wavy set band saw blade (pictured) makes short work of gang cutting pipes. Starrett-engineered blade construction means uniform cutting action, less chance of blade breakage or tooth stripping.



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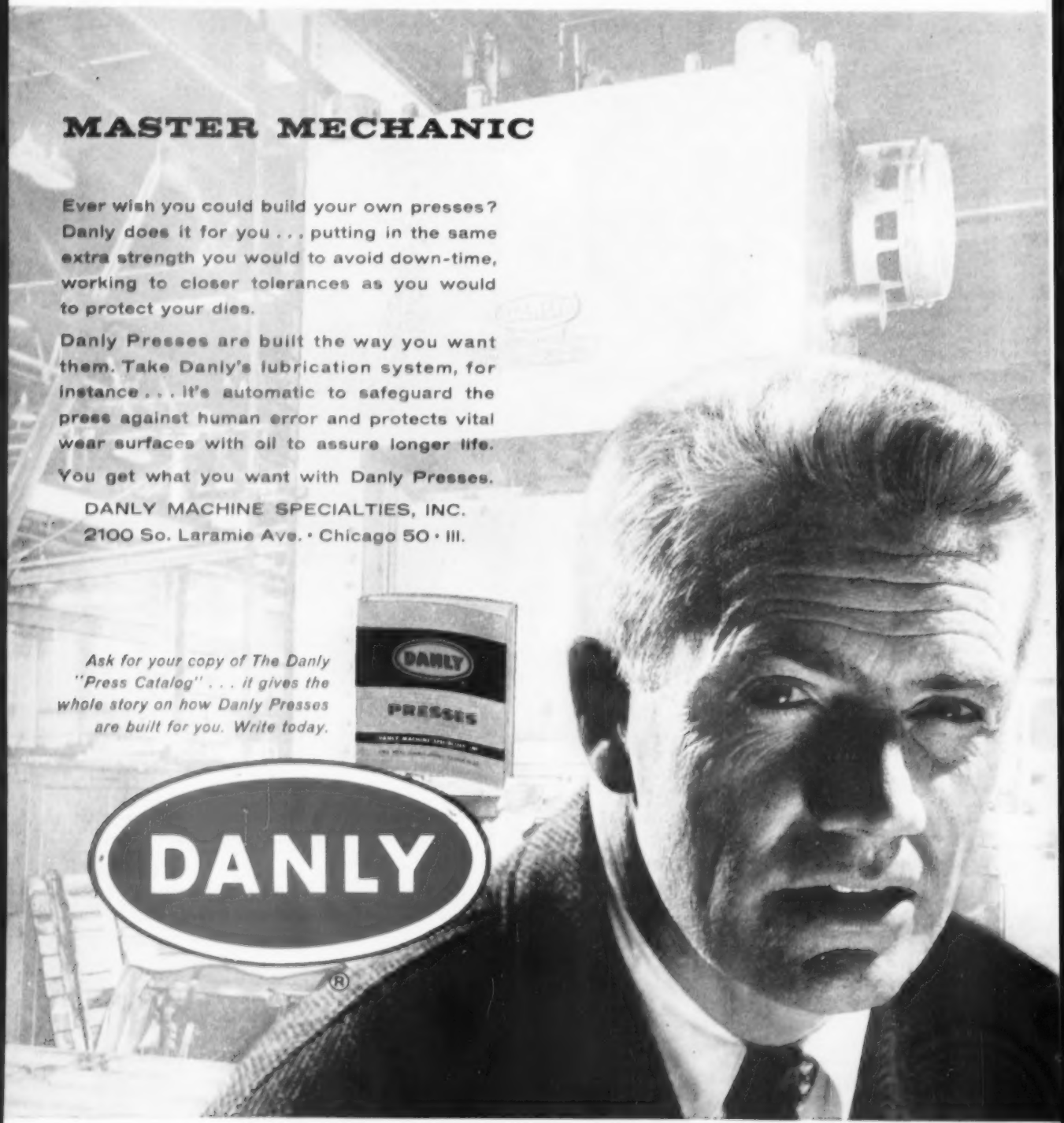
# DANLY



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DANLY
PRESSES

DANLY ®

# Spot news...

- **Automatic loader for between-center work** has been developed for application to grinders, milling machines, chucking machines and lathes. The device can best be installed by a machine tool builder, it is reported, but a well-staffed plant could add it to existing machines without outside help.
- **Impact extrusion slugs can now be cast from ingots in one operation.** It's being done at Impax, Inc, Ferguson, Mo, where a Stroman-designed machine test-manufactured more than 1-million extrusions before going into production. Machine will also produce magnesium extrusions shortly.
- **To help fill the need for more skilled men in Metalworking,** New York's Dept of Labor plans to expand training and supplemental school programs through joint management-labor committees, in master tool and diemaking, electronics, machine installation and machine set-up. It also will advise union locals on retraining older workers to new machines and techniques.

---

This ought to give the lie to claims that automation will bring about an oversupply of skilled workers: Detroit's Superior Brass Works has found that there's such an acute shortage of skilled turret-lathe operators in highly automated Detroit that it has had to shut down its foundry for the second time in four weeks because its machine shop lacks skilled men to keep up with the foundry's output.

---

- **A stamping line capable of producing 3000 auto door panels an hour** is on order. Presses will have moving beds, and automation on this line is carried farther than ever before in the stamping field.
- **New basic pricing structure for bolts** has been announced by Russell, Burdsall & Ward. It calls for quantity brackets with graduated discounts and 2% cash discount on payment terms.
- **All-mechanical automation units** are being built for users who do not have experts on hydraulics and electronics on their staffs. Engineering of these units takes lots of time but design is basically simple—they can be supplied for small parts, stem pinions, shafts, and shell up to 8 in., or loads to 200 lb per piece and more.

---

Two techniques employed by Detroit's Brooks & Perkins in turning out spheres for the 20-in. dia outer-space satellite: (1) hemispheres are deep-drawn with one stroke from 0.030-in. 95% Mg, 3½% Al, 1% Zn alloy with metal heated to 600-700 F in gas furnaces before drawing; (2) proposed method of heli-arc welding hemispheres together employs internal pressure chambers of same metal as sphere.

---

- **Possibility of $100-per-ton scrap steel,** caused partly by shortages resulting from heavy exports, is making some steel users wonder whether the recent hike in steel prices may be followed by a second rise.
- **Here's how auto industry fourth quarter output will stack up with last year:** total industry output of 1,761,000 units will mean a 14% cut by GM, 2% by Chrysler, 9-10% by Ford. This gives the industry a working inventory of less than 600,000 cars as opposed to well over 700,000 last year.

## Spot index to major News stories...


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# "Same Day" Shipment

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# Drill Jig Bushings

Whatever your requirements, Ex-Cell-O's complete bushing service will give you full satisfaction with every order! For your convenience, Ex-Cell-O maintains huge stocks of precision Drill Jig Bushings, and efficient expediting facilities which make possible "same day" shipment. This means orders are filled and dispatched from complete inventories in New York, Detroit, Los Angeles and London, Ontario, within a few hours after they are received!

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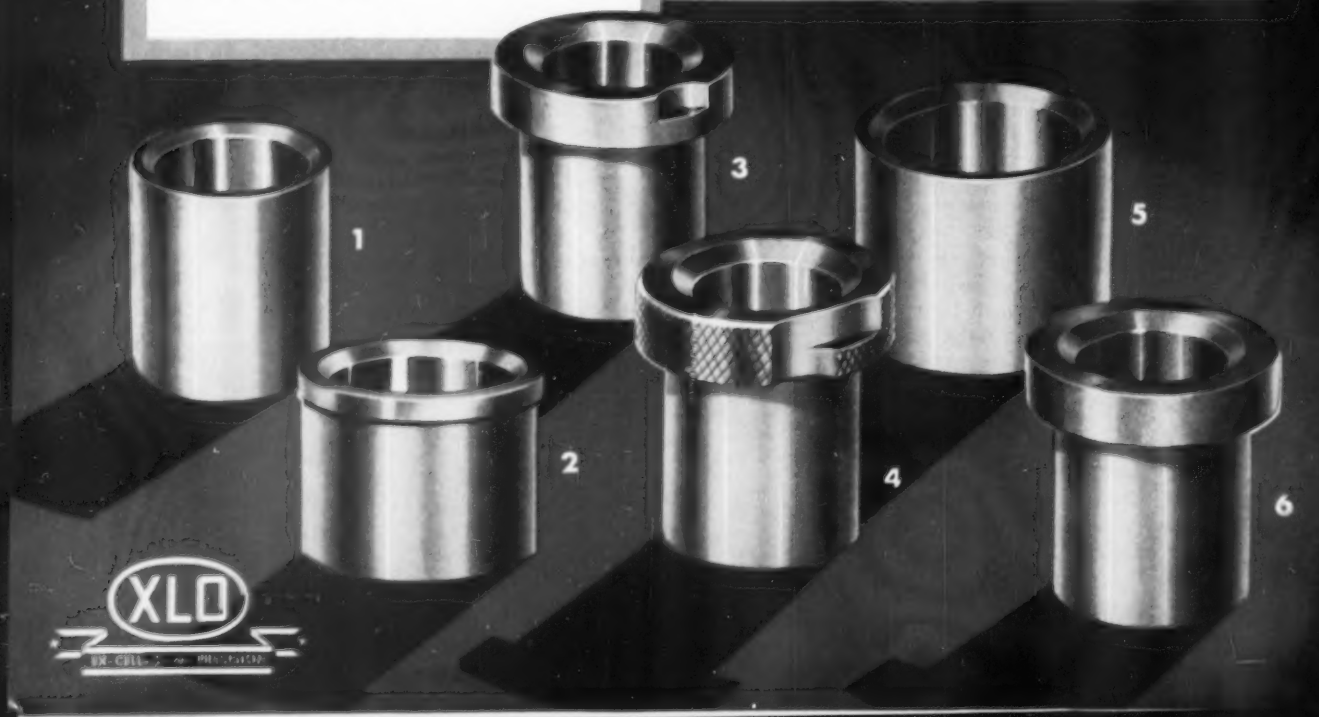
56-12



# Washington ... NEWS REPORT

## Top military contractors . . .

The Pentagon's latest report on biggest military contractors shows up the continuing stress on aircraft, missiles, and electronics in defense production, the cutbacks of tanks, guns, and other so-called conventional weapons. In 1955, aircraft and missile makers accounted for 34.9% of the defense dollar—up 7.8% over 1953.

**With just a few exceptions**—oil and construction companies—the top 35 contractors in 1955, accounting for 56% of total defense production, are all aircraft and electronics firms.

**Following is the 1955 ranking:** Boeing, $797.2 million, 5.2% of total contracts awarded; North American Aviation, $790.9 million; General Dynamics, $781.7 million; United Aircraft, $587.4 million; General Electric, $570.2 million; American Telephone & Telegraph, $505.3 million; Ford Motor, $472.2 million; Lockheed, $412.7 million; Curtiss-Wright Corp, $354.7 million; Douglas Aircraft, $291.1 million.

**Nineteen companies made the top 100 listing** for the first time in 1955. Notable metalworking industry examples: Chance Vought, Burroughs Corp; Lear Inc; Cincinnati Milling Machine Co. Many top contractors in earlier years have dropped out of the latest ranking: Studebaker-Packard Corp, American Motors Corp, Bohn Aluminum & Brass, U S Steel, Food Machinery & Chemical Corp.

**Chrysler is a case study** of how the split-up of the defense dollar has shifted. The firm ranked sixth in volume of military contracts during July 1950-June 1953, the initial Korean buildup period, mainly as a tank producer. During July 1953-December 1954, with cutbacks stemming from the Korean cease-fire, it dropped out of the top 100 listing. In 1955, it returned to the list as 94th. The Pentagon calls last year a "Third Phase" in military procurement: "a more normal period of procurement to modernize the equipment of the armed forces, build up mobilization reserves, and to help maintain the mobilization base."

**Barring a major change** in the international situation, the "Third Phase" will continue as long as defense spending remains at present levels.

## Step-up in Air Force programs . . .

The Air Force is getting authority to use some of the $900 million tacked on to its fiscal 1957 appropriation by Congress. The $100 million earmarked for research and development will go for the Ballistic Missiles Program. Of the $800 million earmarked for aircraft production, about $150 million is being set aside to step up production of Boeing's KC-135 jet tanker; another $70-million will likely be used to buy additional tooling and facilities to boost Boeing's capacity to produce B-52 heavy bombers. But there's still no decision to hike B-52 production rates so the added capacity may be kept on standby for a while.

## New merger drive . . .

The Federal Trade Commission is getting set to launch an all-out campaign against corporate mergers. Thanks to a generous Congress, FTC this year has an extra million dollars in its war chest—earmarked for a stepped-up merger propram.

**The opening gun has already been fired**—a big, new case against Fruehauf Trailer Corp, charging a violation of the Antimerger Law (see page 175). The commission is adding over 100 new employees, expects to be able to file at least 12 more antimerger cases this year.

**But FTC is in a dilemma.** Though Congress gave FTC more money to spend on mergers, it refused stronger legal tools. FTC now has to wait until a merger has been consummated before challenging it. And experience shows that by the time a merger case moves through FTC's machinery, the companies are so scrambled and competitive conditions are so changed that little practical relief may be possible.

**In order to do a really effective job** on mergers, FTC says it needs advance notice from big companies intending to merge and power to block a merger until it decides whether the merger violates the law.

## Campaign on defense policies . . .

Defense spending is going to be one of the big issues of the upcoming campaign. The Democrats are already criticizing the administration's cutback in ground forces and failure to step up heavy bomber production more rapidly. And from the campaign chatter, you might guess that a Stevenson triumph would mean a big boost in military spending. Actually, the long-term trend is for an increase in hard-goods procurement despite the fact that cutbacks in trucks and conventional weapons at present more than offset increased purchases of missiles, new planes and other advanced weapons (see page 174).

BAY STATE

# PRECISION PERFORMANCE...

To the surgeon, precision performance means deft, steady hand movements directed by knowledge gleaned from years of exhaustive study, training, and experience.

To tap users, precision performance means production-line continuity, better threaded parts, increased tap life . . . and BAY STATE!

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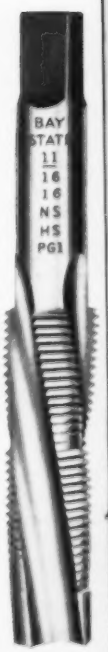

# Detroit ... NEWS REPORT

## $25 Gas-turbine wheels . . .

Back last October, Ford engineering director A A Kucher said "One blade for a gas-turbine for an automobile now costs about $54. We want to get that cost down to about $25 for the whole turbine wheel."

**At that time** a gas-turbine engine for an automobile was pegged at around $15,000. And the industry knew that if it was to give the reciprocating engine a run for its money, gas-turbine engine prices had to be brought down to a competitive price level of around $200-$300. Trouble was, a staggering problem in metallurgy had to be overcome to do it.

**Well, it's been done.** Another automaker (not Ford) is turning out a complete gas-turbine wheel, complete with blades, for less than $25. Not only that, the company expects to get the cost down to $10 soon. The secret? Investment casting.

**The wheel is made from regular aircraft alloys,** heavy on cobalt and nickel. But the hoped-for $10 wheel will use no cobalt, no nickel, in fact no strategic metals at all.

**Another important gas-turbine development** to come out of Detroit is in the metallurgy of the regenerator. Up to now it's been made mostly of stainless steel. Now it turns out that less and less stainless will be needed as time goes on, and probably soon none at all.

**As one metallurgist puts it:** "The thermal efficiency of the gas-turbine right now has a greater potential than the efficiency of any projected reciprocating engine of the future . . . and this efficiency is only the beginning. We have only just begun to cross the threshold of a whole new era in metallurgy. We have only tried so far—with no little success—to match the performance of the critical metals with cheaper substitutes."

**That'll mean a whole new set** of production techniques to work the new alloys. Detroit researchers say already developed techniques for working aircraft turbine alloys are almost useless.

**Now that a lot of the worst problems** are pretty well licked, it's no indication that the auto industry will switch over to gas turbines in a hurry. For one thing, the industry has vast sums invested in its present engine plants and in equipment and tooling for reciprocating engines. It would take unprecedented sums to retool for gas-turbine output, and the 1956 calendar year hasn't been one that tends to make the automakers free with their cash reserves.

**In fact, the very people who have led the parade** in developing the new alloys say the talked-about 1963-1965 gas-turbine introduction years still look about right to them. That's because it would take the same amount of tooling and machining per gas-turbine as for a reciprocating engine—adding up to almost 100% retooling.

**One last note** on development of new gas-turbine alloys: automobile people are making every effort to stay clear of vacuum-melting.

## Production notes and hopes . . .

Plymouth expects to start work on its '57 models about September 10 at its Detroit plant—a little later elsewhere. Dodge will hold to about the same schedule as Plymouth. At DeSoto, all work on 1956's has stopped, and the word is out that big changes are taking place in all plants. Chrysler will start 1957 production in mid-September but it will be a slow start.

**Ford will go into '57 assembly September 10,** after a '56 model run that upped the '55 run by better than 2%. Mercury '56 production is still going on but will stop soon. Lincoln, as usual, is the first Ford line to go into 1957 output.

**Over at GM** most divisions are still turning out '56 models but by mid-September they'll all be changed over to new model output.

## New money for AMC . . .

American Motors drew new life from the banks recently when it obtained $10 million in additional working capital and a new credit arrangement in which its former $73-million credit arrangement has been scaled down to $45 million.

**And annual payments on a $16-million loan** from Prudential Insurance have been partially deferred this year and totally deferred for next year. A new subsidiary started by AMC is currently borrowing $2 million from banks with which to buy ice-cream cabinet leases from AMC. And AMC has sold $6 million of the assets of its wholly owned Refrigeration Discount Corp to the banks and to Prudential Insurance.

## The fourth quarter . . .

Industry production estimates for the fourth quarter of '56 bear out recent forecasts printed in this column. Here's how output stacks up: GM is scheduling about 770,000 passenger cars; Chrysler, 363,000; Ford, about 535,000; and the two independents—American Motors and Studebaker-Packard—expect to turn out some 73,000 units between them. That brings the industry total for the last three months to 1,761,000 units.

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## still the All-American First

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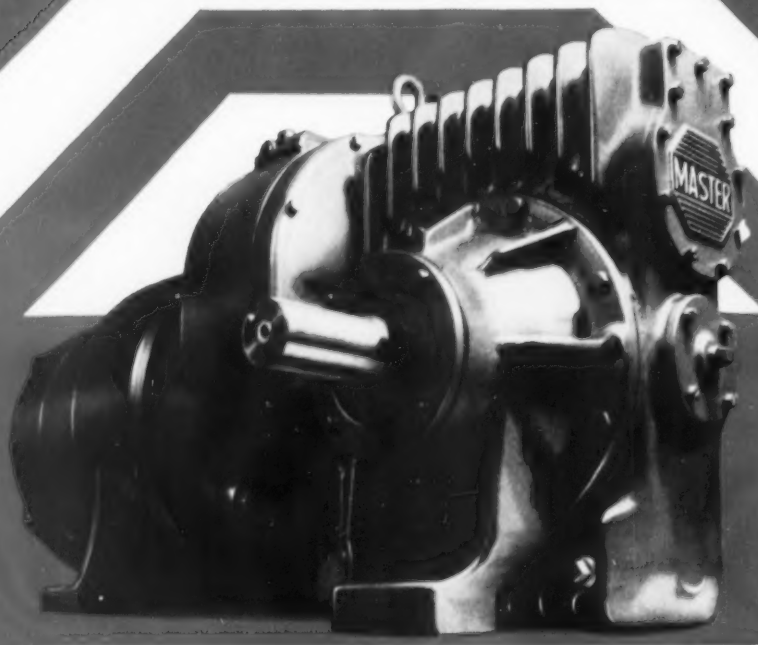


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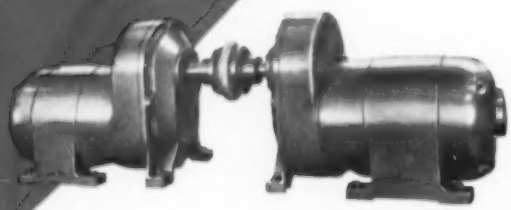

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For five years without stopping, these two 326 frame single reduction gearmotors were run continuously 24 hours a day at full load, one as an induction generator, the other as a gearmotor. When shut down and inspected, Master's conservative design showed *gear wear of less* than .001".

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# Machine tools ... NEWS REPORT

## Big tooling program held up . . .

A stop-order on a mammoth tooling program for a new automatic transmission has been issued by one of the big automobile companies.

**The program is reported to have involved** some 1100 machine tools, many highly automated.

**Most of the machines** are said to have been delivered and installed in the company's Michigan plant.

**Others are well along toward completion** in the shops of machine tool builders. The automobile company has been putting the heat on builders to rush deliveries so that the new transmission could be installed in 1957 models.

**The stop-order is the result of** the discovery of certain difficulties in operating the transmission.

**It will take time to eliminate the trouble.** Meanwhile the automobile firm's new models obviously will not have the new transmission.

**No decision has yet been made** as to what will be done with the machines already installed as well as with those nearing completion in builders' plants.

## New orders far ahead of '55 . . .

Net new orders for metal-cutting machine tools in July totaled $62.1 million, just a shade better than the June figure of $61.8 million.

**Each of the two months**—June and July—was far off from volume maintained earlier in the year. January was the high mark, $109 million, and April, with $79 million, was the lowest month until the summer season came on.

**About $570 million of new business was booked** in the first seven months of 1956, a healthy gain over the same period a year ago, when new orders added up to $431 million.

**Foreign orders thus far this year** comprise around 10% of the total.

**Vacation plant shutdowns caused a dip** in shipments during July. Shipments ran to $65 million, compared with $76 million in June.

**For the year to July 30,** shipments were $483 million, a handsome increase over last year's $369 million.

## Machine tool prices go up . . .

Many machine tool builders have raised prices recently. Increased costs of materials (including steel), of components and of labor have made such action imperative.

**There has not been an across-the-board hike.** And the size of the increase has varied according to types and sizes of machines.

**The rise ranges from 5% to 15%.** Almost all companies have adhered to the policy of announcing the new prices with an effective date far enough ahead that customers can place business for a limited time at the old prices.

**For some builders, this is the second increase** that has been necessary this year. They previously had boosted prices in January.

## Italians set up new body . . .

A special independent organization for standardization and testing of machine tools has been set up by UCIMU (Italian Machine Tool Builders Association).

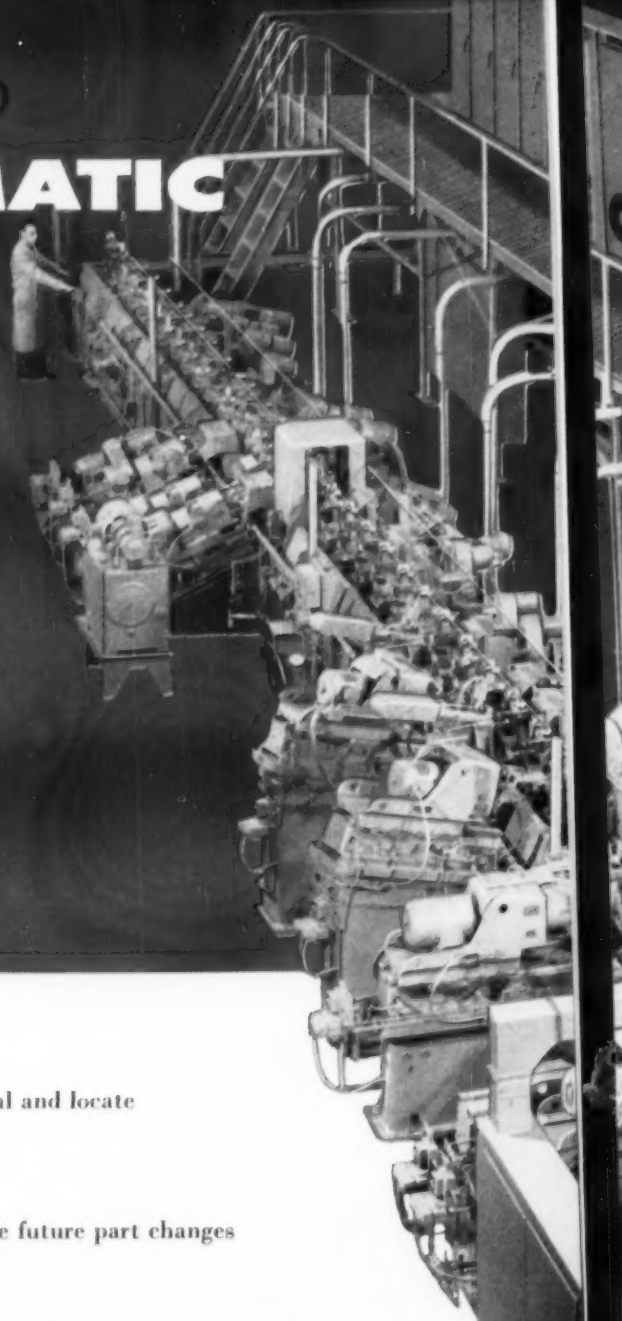
**The new organization is known as STANIMUC** and has offices in Turin, Italy. It intends to study, develop and publish standardization plans for manufacturing machine tools and parts. It also has as its aim close supervision of the quality of Italian-made machines.

**NEW ORDERS FOR MACHINE TOOLS ROSE SLIGHTLY** from $61.8 million in June to $62.1 million in July on the National Machine Tool Builders' Association Index. At the same time, shipments dropped from $76.2 million in June to $65.3 million in July. Primary reason: vacation shutdowns.

# Buhr (43 STATION) ECONOMATIC

## performs 84 operations every 21 seconds!

Production . . .
171 pieces per hour
at 100% efficiency



**OPERATIONS . . .**

33 drilling, 13 countersinking, 16 tapping, 4 reaming, 1 spotfacing, 3 drilling and 3 chamfering . . . plus 14 probing

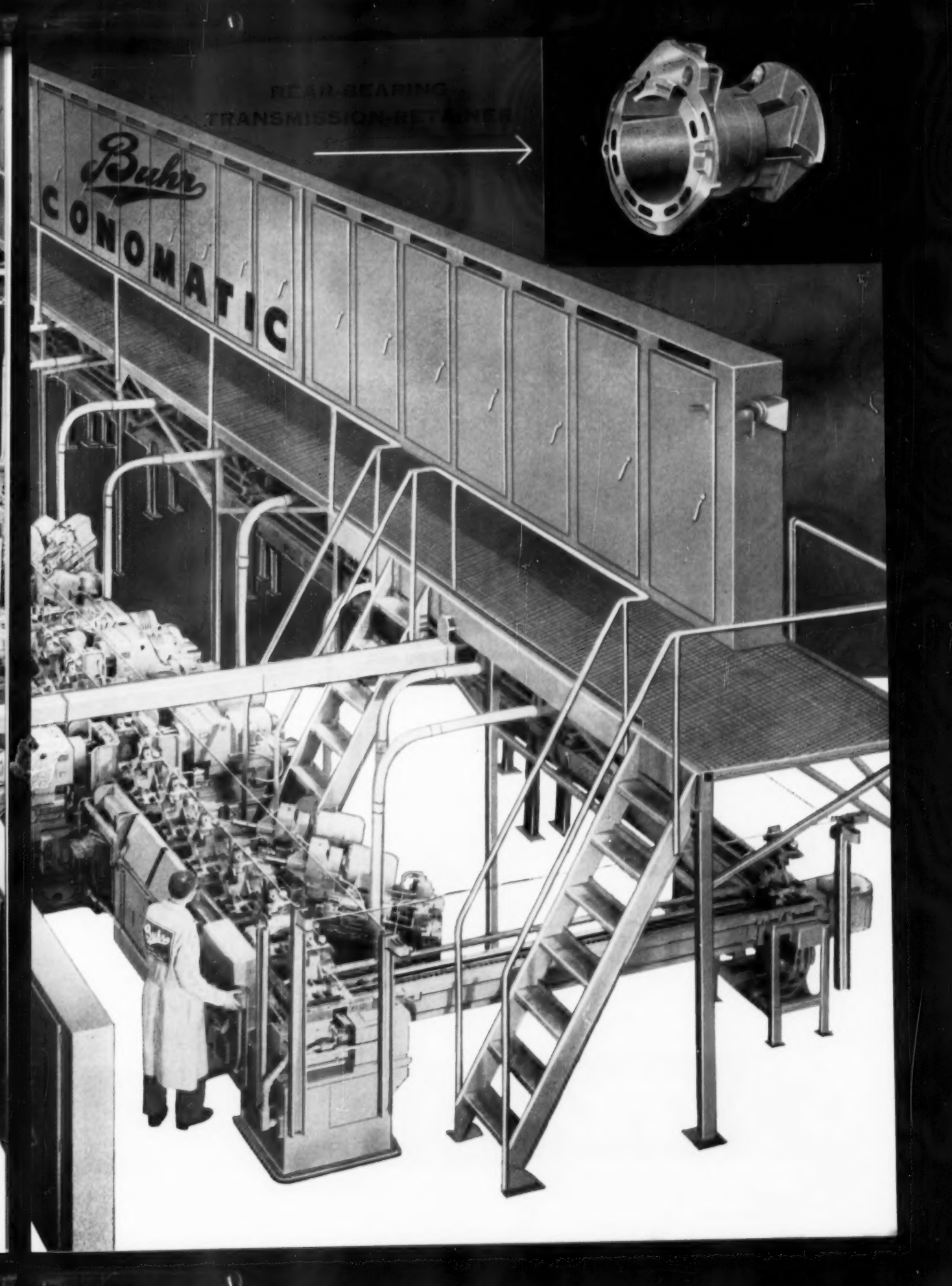
- Elevated electric installations
- Central graphic-control panel
- Exclusive Buhr Detector System in main console to signal and locate electrical failures instantly
- Telephone system with plug-in stations throughout
- Fixtures pressure-cleansed on return
- Distinctive Buhr Sectional-Base Construction to facilitate future part changes
- Central mist-lubrication on all heads
- Automatic lubrication of all moving parts
- Standard and special parts interchangeable for ease of maintenance
- Spindles arranged for pre-setting of cutting tools to minimize downtime for tool changes
- Hardened-and-ground steel ways
- J.I.C. Standards throughout

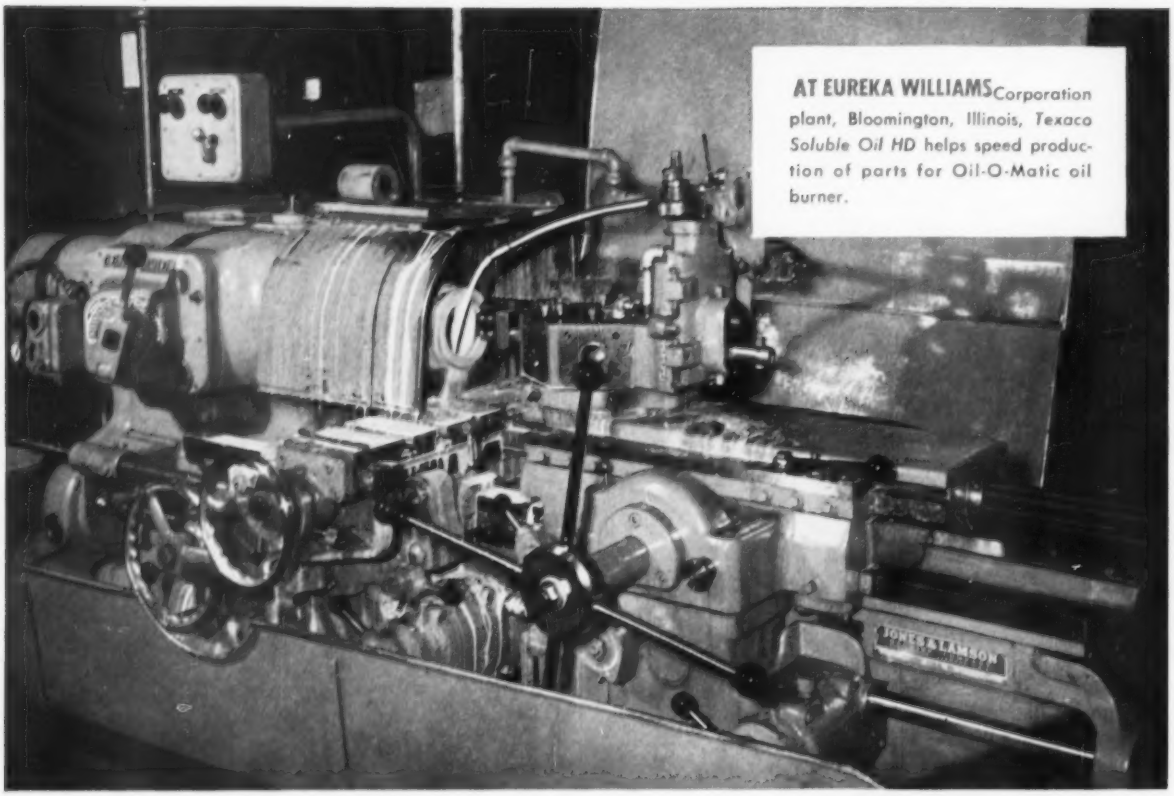
Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

## BUHR MACHINE TOOL CO.©

ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers


REAR-BEARING
TRANSMISSION-RETAINER
Buhr
CONOMATIC



**AT EUREKA WILLIAMS** Corporation plant, Bloomington, Illinois, *Texaco Soluble Oil HD* helps speed production of parts for Oil-O-Matic oil burner.

### Eureka Williams' experience shows how you can

# INCREASE PRODUCTION REDUCE COSTS

"Ours is the oldest name in automatic heating," says Eureka Williams Corporation, "and a big factor in maintaining our position in this highly competitive field has always been our ability to keep our production quality up and our costs low.

"*Texaco Cutting, Grinding and Soluble Oils* – which we have used for more than ten years – have helped us a lot by giving us exceptionally long tool life, eliminating rusting problems and assuring better finish."

Why not enjoy these benefits in your plant? There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the proper ones.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

**EUREKA WILLIAMS** Oil-O-Matic Warm Air Furnaces feature "sealed in steel" construction for cleaner heat, new heat exchanger designed to cut fuel bills. Eureka Williams also makes Gas-O-Matic and Air-O-Matic heating and air conditioning units. Parts for all of them are machined with *Texaco Cutting, Grinding and Soluble Oils.*

TEXACO

**TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS**

# What's ahead ... in Metalworking

NEWS REPORT

## A roaring fourth quarter ahead . . .

All signs point to a roaring fourth quarter in the metalworking industries.

**Support will come from all directions**—the capital goods people, the automobile industry, appliance makers, aviation manufacturers.

**The metalworking production curve** is likely to go up at least a little from the surprisingly high plateau on which it has stayed all during the summer.

**Preliminary figures show,** in fact, that production picked up a bit of momentum in July and August compared with June.

**The frantic flurry for steel** gives a good idea of what's ahead the remainder of the year.

**Because of the jumbled-up mess** of steel makers' order books following the strike, plus receipt of heavy orders since then, many mills are "restricting" fourth quarter sales on almost all items except alloys. "Restricting" is a polite word for allocation.

**Mills are back at capacity operations** insofar as blast furnace and open hearth production permits these days.

**Steel makers are talking in terms of** 100% mill production through the first half of 1957.

**Major support from Detroit is not expected** by the steel people before December, when the public will have given its verdict on 1957 models.

**Auto parts manufacture is about like this:** a trickle of releases has been coming through for the new cars. The production tempo will be stepped up as September goes along. And operations should be back to normal by October 1. Fourth quarter should see output at full capacity.

**It's the same old cheerful story** from capital goods producers. Industrial fastener makers say that sales are well ahead of last year and the fourth quarter will score a new high for the year.

**Material handling equipment builders report** the best bookings in three years. Resistance welding equipment makers have just had their largest month's business in history. Shipments in the first seven months matched those in all of '55.

**Records also are being broken in appliances.** Sales of home laundry units have been the biggest ever. The same goes for vacuum cleaners.

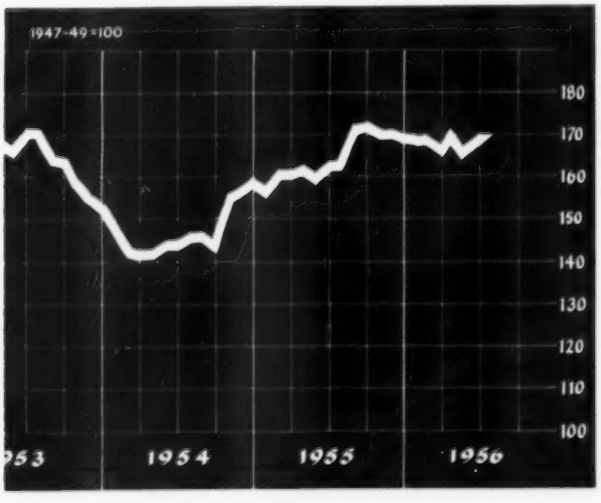
## West Coast aircraft booming . . .

Aircraft employment in southern California is at the highest point in 12 years, thanks to record-breaking peacetime backlogs of air frame companies.

**Plane subcontractors will do a better business** this year than last. There is a growing amount of work on missiles, and even more in electronics. Commercial jobs are on the rise too.

**Some complaint is made,** however, that prime contractors are beating down prices.

**Douglas and Lockheed have started letting contracts** for new jet transports. Lockheed's Electra will get to the assembly stage early next year and the Douglas DC-8 sometime in the spring.




**AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION**

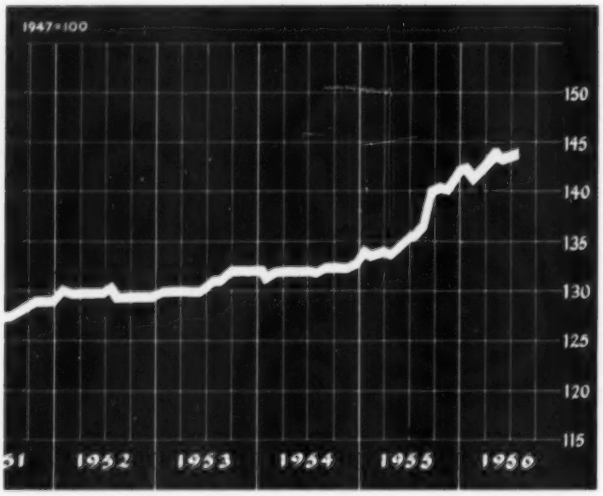
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

| | AUGUST Estimated | JULY Preliminary | JUNE Revised | JULY Year Ago |
|---|---|---|---|---|
| **Total Index** | **171** | **171** | **168** | **167** |
| **Machinery** | **151** | **149** | **138** | |
| **Electrical Machinery** | **212** | **205** | **197** | |
| **Autos** | **110** | **110** | **147** | |
| **Other Transportation** | **333** | **333** | **298** | |
| **Other Metalworking** | **141** | **138** | **138** | |

# NEWS REPORT What's ahead . . . in Business

**AMERICAN MACHINIST INDEX OF METALWORKING PRICES**

| | AUGUST Estimated | JULY Preliminary | JUNE Revised | JULY Year Ago |
|---|---|---|---|---|
| **Total Index** | **144.5** | **144.2** | **144.0** | **135.8** |
| **Metalworking Machinery** | 165.8 | 165.8 | | 155.4 |
| **Other Machinery exc. Electrical** | 151.4 | 150.9 | | 140.3 |
| **Electrical Machinery** | 143.2 | 143.2 | | 131.9 |
| **Fabricated Metal Products** | 137.5 | 137.5 | | 131.5 |




## Rising prices take the spotlight . . .

Rising prices have taken the spotlight as the most important recent development affecting industry in general. One purchasing department, typical of many others, reports that notices of price advances have been so thick in numbers that it is hardly able to keep up with them.

**Industrial prices have been going up** at a moderate rate since late 1954. They have turned up more sharply since June, 1955, and the average gain since then has been roughly one-half percent a month.

**The upward movement has been contagious** in that it has spread also to consumer prices.

**After fluctuating in a narrow range** of 113.5 to 115.4 since January 1953, they suddenly zoomed to 117 in July (1947-1949=100). That represents a gain of 1½% in two months.

**Projected onto an annual basis,** the recent upturn in prices would amount to 9%. But it is extremely unlikely that so sharp a rise would continue so long.

**Inflation threat becomes even more potent** when the course of farm prices is examined. Wholesale prices of farm products have jumped about 10% since last December.

**All of these price advances,** however, do not mean that the national economy is beginning a long upward flight into inflation.

**Inflation usually is the result of scarcity.** And there certainly is no scarcity of goods just now. **More than that,** Federal Reserve is ready to step in with further money controls if necessary. It has just raised the discount rate again and will repeat the action should it seem desirable.

### WEEKLY BUSINESS INDICATORS

| | Latest Week | Preceding Week | Year Ago |
|---|---|---|---|
| *Business Week* Index of Activity (1947-49=100)* | 146.5 | 146.0 | 140.8 |
| Steel ingot production (thousand tons) | 2,376 | 2,359 | 2,255 |
| Electric power output (million Kilowatt hours) | 11,340 | 11,794 | 10,906 |
| Production of automobiles and trucks | 88,733 | 126,675 | 155,225 |
| Engineering construction awards (Eng. News-Record, millions) | $616.6 | 321.4 | 330.3 |

### MONTHLY BUSINESS INDICATORS

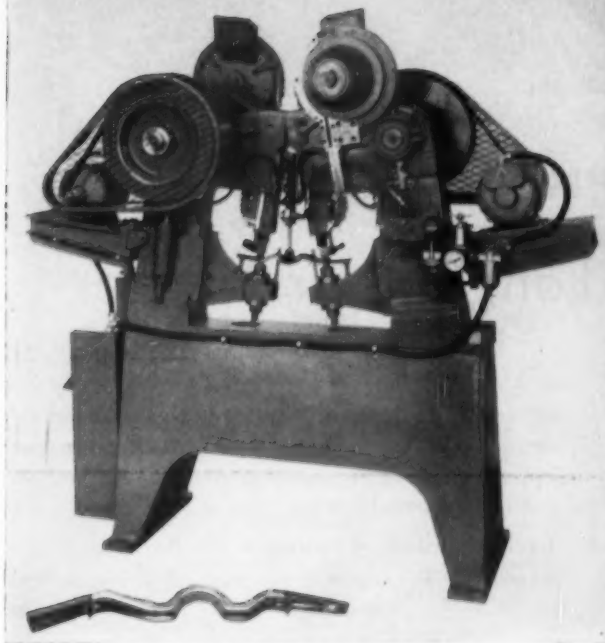
| | Latest Month | Preceding Month | Year Ago |
|---|---|---|---|
| Refrigerators sales (thousands of units) | 335 | 248 | 397 |
| Vacuum cleaners sales (thousands of units) | 248 | 326 | 242 |
| Washers sales (thousands of units) | 340 | 315 | 354 |
| Household electric ranges sales (thousands of units) | 85 | 86 | 105 |
| Radio production (thousands of units) | 1,073 | 799 | 1,205 |
| Television production (thousands of units) | 553 | 468 | 590 |
| Gear sales index (1947-49=100) | 245.4 | 275.6 | 193.5 |
| Foundry equipment new orders index (shipments, 1947-49=100) | 156.7 | 207.0 | 186.8 |

* Seasonally adjusted.

# T-J

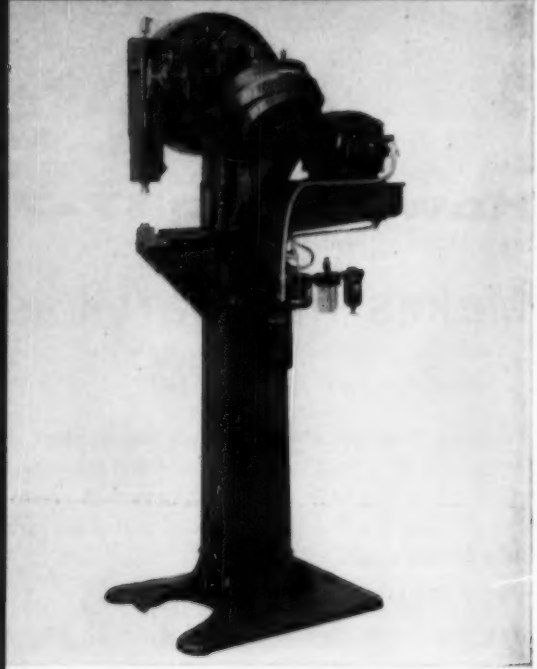
*does your riveting and clinching*

# Faster...Automatically!



This T-J Special Dual Rivitor sets two rivets at a time . . . consists of two 8" throat Model R Rivitors, each with 10" hopper, special oversize anvil post, and special horn. Sample of work shown below machine.

## RIVITORS



T-J Clinchors adaptable to a wide range of clinch nut setting problems. Gravity feed model shown here.

## CLINCHORS

*Automatic feeding and setting* with T-J Rivitors and Clinchors help you reduce labor and step up SPEED in a wide range of assembly jobs for aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

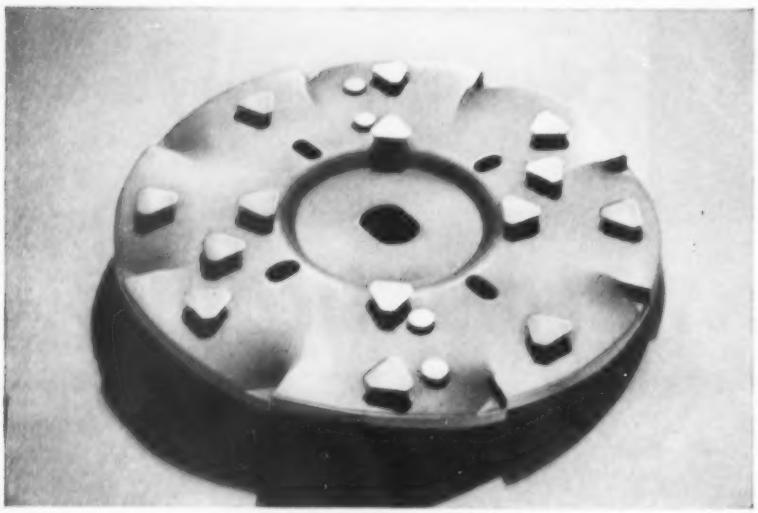
T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅜" long. Air-powered sets aluminum alloy rivets or steel rivets up to ¾" long. Throat depths 8" to 36".

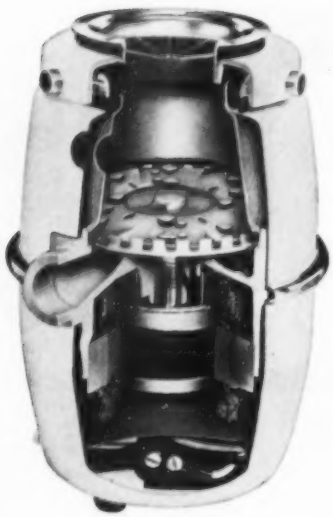
Write for Clinchor bulletin 555; Rivitor bulletins 646 and 555. The Tomkins-Johnson Co., Jackson, Mich.

T-J **TOMKINS-JOHNSON**

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

***39 Years Experience***





# How Armco 17-7 PH Stainless

## Makes this part Last Longer, Work Better

Formerly made of chrome-plated carbon steel, this cutter disc for a food waste disposer was reducing the efficiency of the unit. The combination of corrosion and abrasion in grinding food wastes dulled the carbon steel cutting edges.

### 17-7 PH Solves Problems

Now the cutter discs are made of Armco 17-7 PH Stainless Steel . . . and the troubles are gone. The combination of high hardness and good corrosion resistance obtained with 17-7 PH makes the part much more durable and the cutter has a 15 to 20% faster cutting action.

Fabrication is simplified, too. The cutting blades, 17-7 PH cold-headed rivets, are attached to the formed 17-7 PH disc. Then the assembly is hardened. A simple heat treatment at 1400 and 950 F hardens the entire part to Rockwell C 40.

### Unusual Properties

This cutter disc is typical of the improved performance and production you can obtain by utilizing the unusual combination of properties you get in Armco 17-7 PH. Extra high strength and hardness, good corrosion resistance and excellent fabricating characteristics give you many new opportunities to improve your product and reduce manufacturing costs as well.

### Two Grades Available at Armco

Armco 17-7 PH is supplied in sheet, strip, plates, bars and wire. A companion grade, 17-4 PH—hardened at only 850 to 900 F, is produced in bars, wire and billets. For complete data on these special Armco Stainless Steels, just fill out and mail the coupon.

**Armco Steel Corporation**
**2166 Curtis Street, Middletown, Ohio**

We are interested in your new Stainless Steels for these applications: _____

Please send us information on:

- ☐ Armco 17-7 PH sheets, strip and plate
- ☐ Armco 17-7 PH bars and wire
- ☐ Armco 17-4 PH bars, wire and billets

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

## ARMCO STEEL CORPORATION

2166 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

ARMCO®

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

# How To Get 10% More

Back in 1954 a new Internal Revenue Code came into being. It embodied a sharp departure from previous practice in the permissible method of depreciating production equipment for tax purposes.

Up to then, a manufacturer had been compelled to stick to straight-line depreciation, even though the early years in the life of a machine were the most useful.

A profound change became effective with all production equipment acquired from January 1, 1954, on. The double-rate declining-balance method could be used. Or the so-called sum-of-the-digits method could be elected.

## This shift in tax policy . . .

made it possible for a manufacturer who chose either of the two new methods to write off two-thirds to three-fourths of the cost of new equipment in the first half of the estimated service life.

The new policy has now been in effect for two to three years. It is the law of the land. But are you taking advantage of it? And if not, why not?

The reasons why you should take advantage of the new policy, if you are not already doing so, are set forth by George Terborgh in a newly-published booklet issued by the Machinery and Allied Products Institute.

Mr. Terborgh points out that depreciation is normally the major source of business investment funds. Because the most valuable services of a productive asset, such as a machine, are used up soon after being put to use, the decline in the value of the asset is accelerated. That is, it is more rapid in the early part of its service life than in the later.

## Since this is so . . .

depreciation charges should be in keeping with the decline in the actual value of the asset to management.

To be purely selfish about it, the only sensible thing for you to do, under the circumstances, is to write off new equipment by either the double-rate declining-balance method or the sum-of-the-digits method.

You will find that if you do that, the after-tax return on your investment will be 10% to 15% higher than if you continue to use the old, outmoded, straight-line method. On that basis, you have everything to gain and nothing to lose.

## We agree with Mr. Terborgh . . .

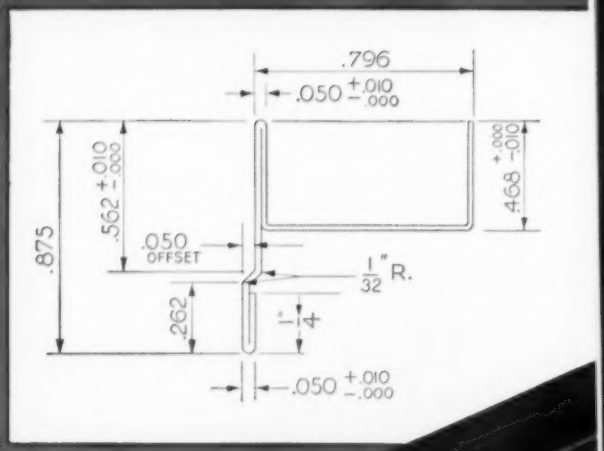
in his observation that "no management can properly be indifferent to an improvement of 10% or better in its after-tax return from depreciable assets, especially an improvement obtainable with so little effort and expense."

Burnham Finney EDITOR

A CINCINNATI PRESS BRAKE

# accurately forms this difficult shape

. . . at The J. Clytel Manufacturing Co.
*Metal Fabricators* Cleveland, Ohio

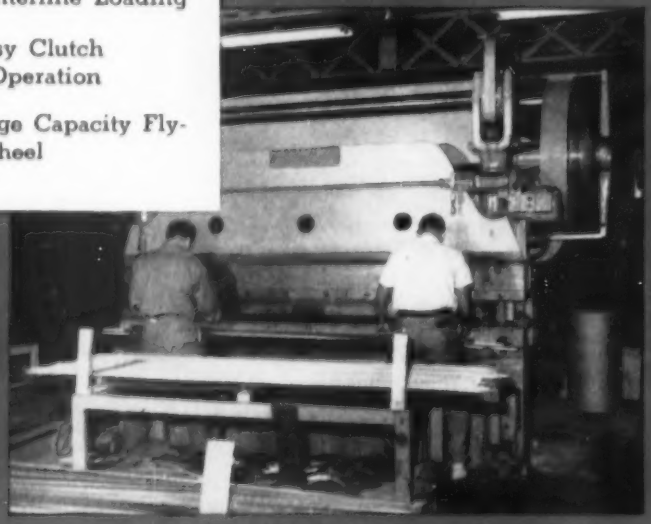



**Cincinnati Features . . .**

**Insure this accurate Performance**

- All-Steel Interlocked Frame
- Deep Beds and Rams
- Centerline Loading
- Easy Clutch Operation
- Large Capacity Flywheel

One of the efficient die set-ups used on this job



*Photos courtesy the J. Clytel Manufacturing Company, Cleveland, Ohio.*

These galvanized steel channels for sliding window frames must be formed straight and true, and all dimensions held to close tolerances.

The Clytel Company say: "Our press room feels that only Cincinnati makes Press Brakes."

Consult our engineering department on your forming problems.

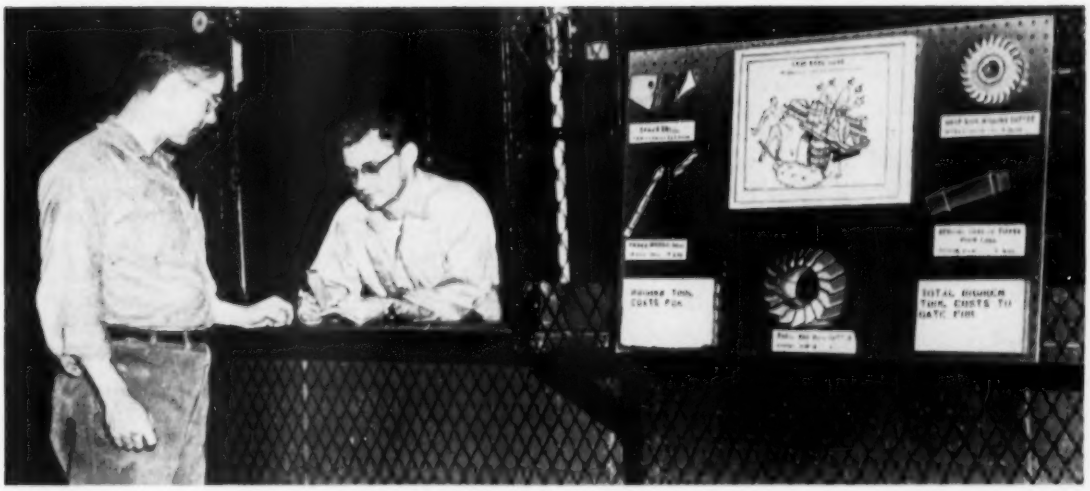
Write for comprehensive Brake Catalogue B-4.

CINCINNATI

## THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

American Machinist



**AT EACH TOOLCRIB** dispensing cutting tools, Ford AED tool-control engineers keep up-to-date a display board showing tools recently broken in areas served by the toolcrib

# Ford reworks obsolete tools

**Nearly $500,000 was saved last year at Ford's Aircraft Engine Division plant in Chicago by a four-point cost reduction program designed to insure fullest possible use of all available cutting tools, gages, and jig and fixture parts**

BEN C BROSHEER
associate editor

Cost of tools and gages used to machine and inspect precision parts easily can get out of control when product design changes frequently—as is the case with turbojet engines for military aircraft. To hold tool costs at reasonable levels in such plants, it is necessary: (1) to control tool procurement so large stocks of expensive tools are not on hand when part design is changed enough to make the tools obsolete, (2) to make as effective use as possible of tools in active service, and (3) to salvage and put to other uses tools that become surplus and/or obsolete.

At Ford's Aircraft Engine Div plant in Chicago, where 10,000-lb thrust class J-57 turbojet engines are made under Air Force contracts, this was not an easy problem to solve.

Several months ago, a survey showed that the 150,000 cutting tools in active use on Jan 1 '56 were made up of approximately 6,000 different designs and sizes. Only about 10% of them were standard vendor-catalog items. There were 5281 different active *special* designs of cutting tools—including 2635 designs and sizes of single-point tools, 1135 different types and sizes of special drills, 624 different reamers, and 165 different taps.

It is possible to achieve a large measure of control over the cutting tools — proven by the fact that more than $2,000,000 in tool cost has been saved during the past 3 yr by effective use of a novel tool-control program that has four major phases: (1) tool control, (2) cutting-tool salvage, (3) salvage and reuse of gages

and (4) diamond-tool control and salvage.

During 1955, 41,500 surplus or obsolete cutting tools were reworked and put to use on other jobs with a net savings of approximately $201,000. Some 3,360 surplus gages were reworked at a savings of $153,700, and $59,800 worth of jig, fixture and special gage components were salvaged and put back into service. These savings represent the value of tools and components that otherwise would have been purchased, less the cost involved in reworking the salvaged items.

## TOOL CONTROL PROGRAM

By helping with operator training, and insistence on continued use of the proper tools and methods set up for each machining operation, the Tool Control Group in the Tool Standards Section effected a reduction in tool-breakage costs of more than $100,000 during the first year this program was in effect. These cost reductions continue.

The perishable-tool engineers work with methods and process engineers, shop supervisors and the operators themselves to insure that machine operators are supplied with the correct tools for their jobs, and that these tools are used properly. Display boards are placed at each toolcrib (see photo) to remind machine operators how much the cutting tools they break cost the taxpayers—as part of the price they pay for warplanes.

Perishable-tool engineers also work closely with process and design engineers and methods engineers to help minimize the need for specially designed tools. When the program was started each tool of different design and size was used for an average of 1.33 operations—in more recent tooling pro-

**IMPORTANT IN TOOL CONTROL PROGRAM** is weekly report of tools ground, and tools replaced because they were broken, worn out or lost. Made up for each machining department and summarized, as above, for all departments, reports show weekly totals, and accumulated totals for the year-to-date. Thus the above summary for the week ending 1/1/56 indicates that 206,131 tool transactions were reported for all of 1955, for the reasons shown. Because of increased production rates tools exchanged weekly now total about 7,500—instead of the nearly 4,000 weekly average for 1955

**PERISHABLE CUTTING TOOL USAGE REPORT**

To: GENERAL SUPERINTENDENTS
SUPERINTENDENTS
GENERAL FOREMEN
FOREMEN

WEEK ENDING 1-1-56

DEPT. ALL

| CODE NO. | DESCRIPTION | CUTTER GRIND THIS WEEK | CUTTER GRIND ACCUM. | SALVAGED BROKEN THIS WEEK | SALVAGED BROKEN ACCUM. | SALVAGED WORN OUT THIS WEEK | SALVAGED WORN OUT ACCUM. | SALVAGED LOST THIS WEEK | SALVAGED LOST ACCUM. | TOTAL TOOLS USED THIS WEEK | TOTAL TOOLS USED ACCUM. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | SOLID | 176 | 8232 | 20 | 795 | 2 | 579 | 1 | 9 | 198 | 9615 |
| 9 | SINGLE POINT | 2130 | 107496 | 255 | 11825 | 85 | 8580 | 9 | 1097 | 2479 | 128996 |
| 12 | REAMERS SOLID | 148 | 7068 | 20 | 838 | 3 | 435 | 2 | 241 | 173 | 8582 |
| 15 | REAMERS INSERTED BLADE | 1 | 95 | | | | | 1 | 1 | | 96 |
| 20 | C'BORES C'SINKS | 109 | 3420 | 7 | 215 | 1 | 118 | 1 | 31 | 117 | 3784 |
| 25 | FACING CUTTERS INSERTED BLADE | 1 | 1 | | | | | | | 1 | 1 |
| 50 | CIRCULAR FORM | 2 | 144 | 1 | 37 | 1 | 14 | 1 | 1 | 2 | 176 |
| 51 | STRAIGHT FORM | 8 | 270 | 1 | 14 | 1 | 12 | 1 | 4 | 9 | 300 |
| 52 | BROACHES | 73 | 817 | 1 | 1 | 1 | 3 | 1 | | 73 | 821 |
| 54 | GEAR CUTTERS | 21 | 981 | 1 | 12 | 1 | 24 | 1 | 8 | 21 | 1025 |
| 55 | MILL CUTTERS INSERTED BLADE | 4 | 487 | 1 | 15 | 1 | 11 | 1 | 20 | 4 | 533 |
| 56 | DRILLS ALL TYPES | 781 | 37116 | 79 | 3529 | 36 | 1271 | 3 | 399 | 899 | 42315 |
| 59 | MILL CUTTERS SOLID | 97 | 4213 | 4 | 232 | 3 | 228 | 1 | 44 | 104 | 4716 |
| 57 | TAPS | 136 | 3443 | 22 | 886 | 4 | 536 | 2 | 306 | 164 | 5171 |
| | TOTALS | 3685 | 173781 | 407 | 18378 | 134 | 11811 | 17 | 2161 | 4243 | 206131 |

HEAVIEST BREAKAGE

| NO. | TOOL NO. | PART NO. | OPER. NO. | NO. BROKE | COST EA. NEW |
|---|---|---|---|---|---|
| | | | | | |

DEPT BREAKAGE $ THIS WEEK
DIVISION BREAKAGE $ THIS WEEK 10.0
DEPT ACCUM. BREAKAGE $
DIVISION ACCUM. BREAKAGE $ 10.0

TOOL STANDARDS

**PERISHABLE CUTTING TOOL AND DESIGN CATALOGUE**

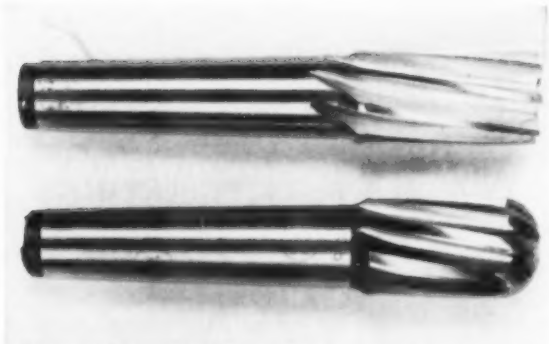
DRILLS: SECTION 1 PAGE 3

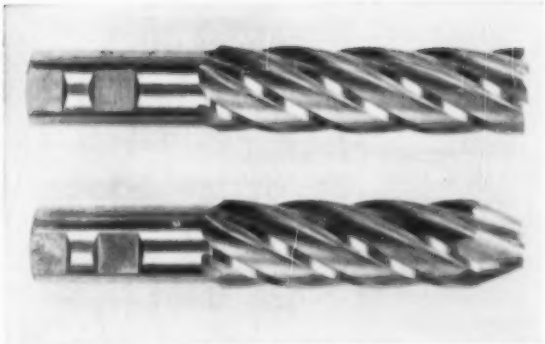
| DIAMETER MAX. | DIAMETER MIN. | TYPE | TANG / TAPER | O.A.L. | FLUTE | SALVAGE O.A.L. | DRILL POINT | IDENTIFICATION CODE | IDENTIFICATION SERIAL | STATUS CUR. | STATUS OBS. | REVISED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0700 | .0692 | G | | 2.0 | 1.0 | 1.5 | 118 | F7 | 30024 | X | | |
| .0700 | .0692 | G | | 2.0 | 1.0 | 1.25 | 118 | VE | 21296 | X | | |
| .0700 | .0692 | G | | 3.0 | 1.5 | 2.25 | 180 | F7 | 25059 | X | | |
| .0700 | .0692 | G | | 3.0 | 1.75 | 2.37 | 118 | F7 | 27009 | X | | |
| .0700 | .0692 | G | | 4.5 | 2.5 | | 118 | 3176 | 30083 | | | |
| | | | | | | | | VE | 21032 | X | | |
| .0715 | .0777 | F | | 4.0 | 2.0 | 3.75 | 118 | F7 | 25963 | X | | |
| .0715 | .0777 | F | | 5.25 | 3.0 | | 118 | F7 | 26401 | X | | |
| .0725 | .0777 | G | | 3.63 | 1.88 | | 118 | VE | 21071 | | X | |

ALL PREFIXED CODE NUMBERS ARE 38
EXAMPLE: 38-VE-11000

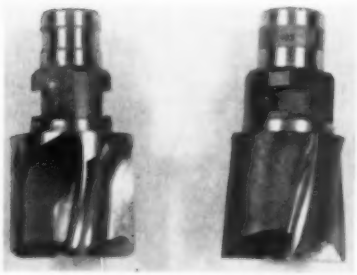
TYPE: C - COBALT
F - FAST SPIRAL
H - HEAVY DUTY
S - GENERAL PURP
O - OIL HOLE
TC - CARBIDE TIPPED

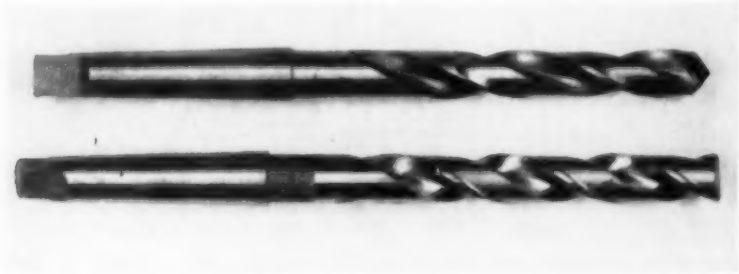
**SPECIAL CUTTING TOOLS** used in the AED plant are listed in looseleaf catalogs maintained by the Tool Standards Section. Each sheet is designed to show principal dimensions and characteristics of tools listed, as well as minimum dimension for critical section of tool—as "drill length" in above list—below which the tool is too small for use in operations for which originally purchased





**TYPICAL CONVERSIONS** of end mills during salvage operations include the grinding of special nose shapes on standard cutters, and/or regrinding OD and flutes to reduce tool diameter. Fluted core drills often are reground similarly, and reamers sometimes are converted from staight-flute tools to stepped reamers. Carbide-tipped single-point tools often can be converted by regrinding the nose radius





**WHEN SALVAGING THE COUNTERBORES** (left), OD was reduced by cylindrical grinding and radiuses were ground on the lips. Drills (right) often can be salvaged by regrinding points to different included angles, or by grinding flutes to make stepped drills

grams this average has been increased to 1.5 operations, and optimistic members of the group expect it soon to approach 2.0 operations per tool type and size.

The tool-control program has been expedited by the development of catalogs of active and obsolete perishable cutting tools available in toolcrib stocks. These catalogs (see sample page) are distributed to design and process engineering groups, as well as to tool-salvage engineers.

Particular attention is given to all tools used "out of process." When used on jobs for which they were not designed, cutting tools usually both decrease the efficiency of the machining operations, with resultant higher production costs and increased tool breakage, and rob other jobs of their assigned stocks of tools. This upsets the tool-procurement program—which is planned to maintain an economic float of tools for each operation.

## TOOL-SALVAGE PROGRAM

Cutting tools of conventional designs often can be reworked into other designs (see photos) when they become surplus for one reason or another. Large stocks of such tools are available at the Aircraft Engine Div plant because:

1. When the Ford Motor Co undertook operation of this facility for the production of radial piston-type aircraft engines, the Air Force made available large quantities of obsolete cutting tools from storage depots so tooling programs could be expedited and costs held to a minimum.

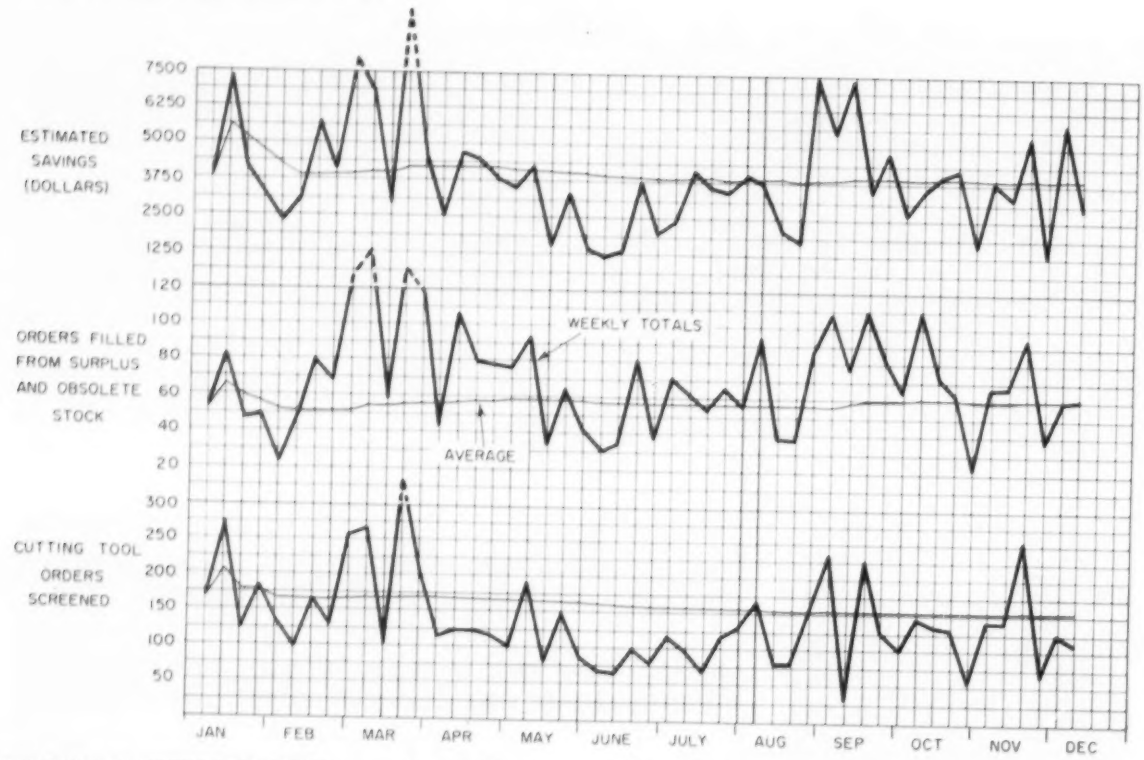
2. More cutting tools went into the obsolete stock when the plant stopped making piston-type engines, and changed over to the production of turbojet engines.

3. Smaller quantities of cutting tools are added to this stock from time to time as they become surplus or obsolete, because of changes in product design or improvements in manufacturing methods.

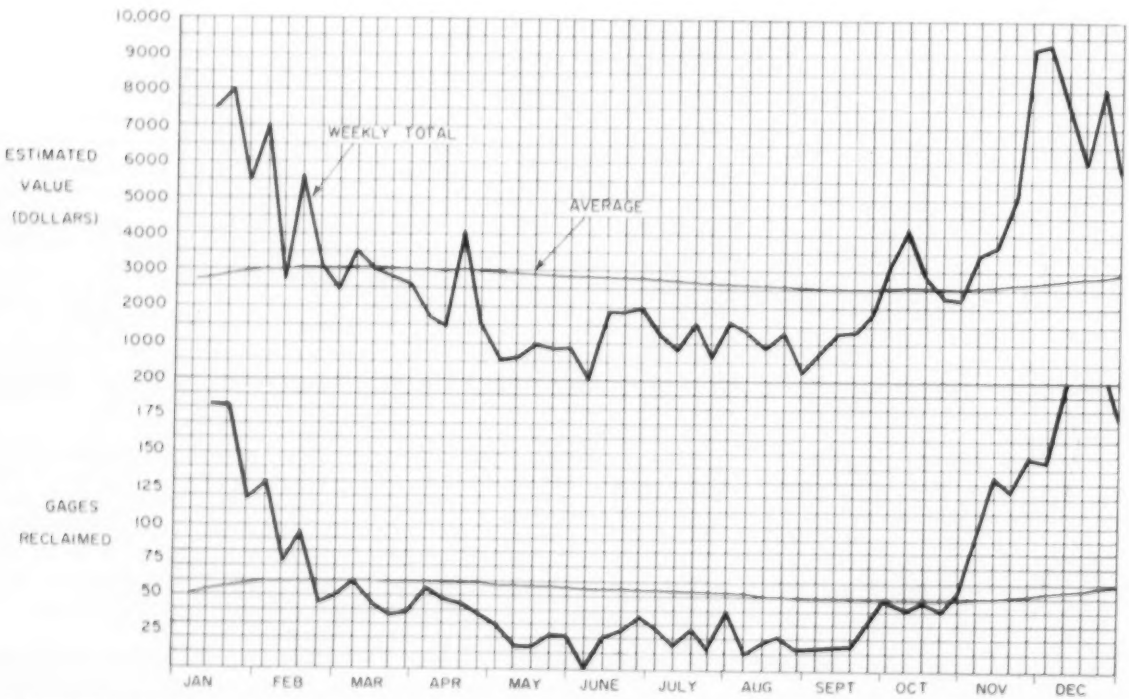
When requisitions are entered for new cutting tools, whether for process-development work or for new production operations, and the tools are not available in toolcrib stocks, the requisitions are routed to a group of perishable-tool engineers in the Tool Standards Section. These engineers determine if any available surplus or obsolete tools can be reworked economically.

If so, a *perishable-tool rework request* form (see sample) is made out and routed to the Nonproductive Material Control Group, whose responsibility it is to authorize rework operations or tool-purchase requisitions, as may be necessary.

This program has the added advantage that tools needed immediately—because of unexpected stock depletion from excessive tool breakage, or because some vendor




**THIS CHART OF CUTTING-TOOL ORDERS** screened for possible use of surplus or obsolete tools orders filled and savings realized during 1955 indicates than an average of $4,000 was saved weekly by processing an average of nearly 160 requisitions weekly through the Tool Salvage Group. About 60 such orders were filled weekly




**AN AVERAGE OF NEARLY 60 GAGES WERE RECLAIMED WEEKLY** during 1955 by the Tool Salvage Group, for an average weekly savings of nearly $3,000. These gages include standard plug, ring and snap gages, not special gages from which standard components were removed before the gages were scrapped

**WHEN NEEDED TOOLS** are to be made by reworking available tools, the tool-salvage engineer prepares this form, then forwards it to the Nonproductive Material Control Group for processing. During the past 3 yr more than $2,000,000 has been saved by reworking available surplus or obsolete cutting tools under this salvage program

did not deliver tools according to schedule—often can be reworked from obsolete tools and put into service before the operation need be shut down for lack of tools. Even when tools thus made available may cost more than purchased tools, they usually are less expensive than a work stoppage.

## SALVAGE OF TOOL COMPONENTS

Obsolete standard gages, and standard components of special gages, jigs and fixtures, are reviewed by tool engineers in the Tool Standards Section. Wherever possible usable components are removed, reconditioned and stored for future use before the tools are scrapped. Conventional ring, plug and snap gages often can be salvaged by grinding and/or resetting to other sizes—approximately 60 such gages were reclaimed weekly last year, at a savings averaging close to $50 per gage. Dial indicators, hardened steel anvils and locating blocks, pins, clamps, etc, are removed from special gages, jigs and fixtures for reuse. Some $5,000 worth of such components were salvaged each month last year.

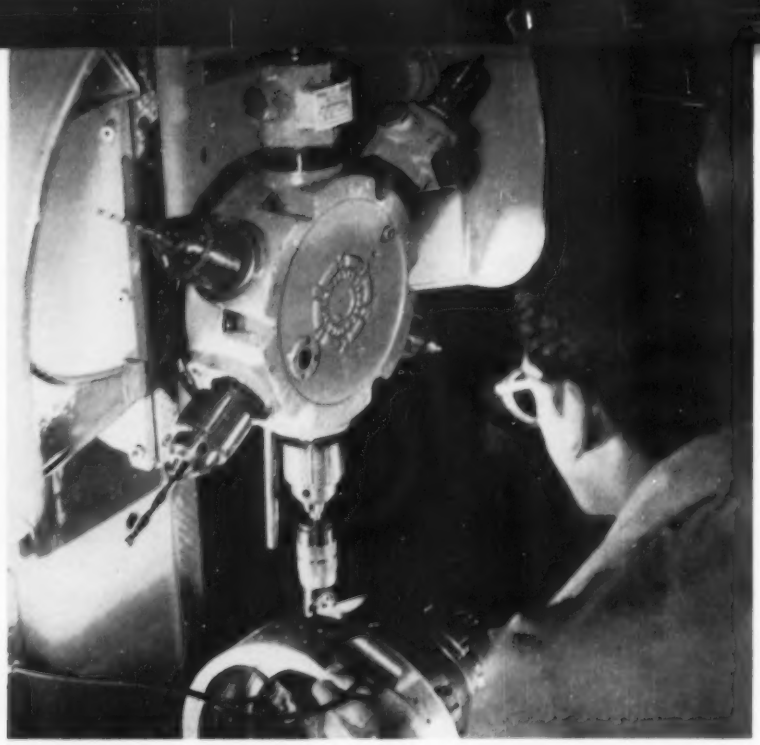
## CONSERVATION OF DIAMONDS

More than 10,000 carats of industrial diamonds are in use or in toolcrib stocks at this plant. Most of these are used for dressing grinding wheels; a few for precision boring operations. In addition, of course, diamond grinding wheels and lapping compounds are used for finishing cutting surfaces of carbide-tipped tools.

To minimize costly delays when a required diamond-tipped tool is not available, the Aircraft Engine Div has set up a special diamond toolcrib for reworking diamond tools, and for development of improved tools with diamond tips. It is under the supervision of Robert Reis, a master gem cutter who learned his trade at the famous German gem center of Idar-Oberstein.

In addition to actual work on diamond-tipped tools, this center has been used effectively for developing standards for diamond-tipped tools on which purchase specifications, and vendor performance ratings, can be based.

**THE SPECIAL DIAMOND TOOL CRIB** installed by Ford's Aircraft Engine Div has paid dividends by developing standards from which purchasing specifications are prepared and by providing bench-marks by which performance of tools supplied by various vendors can be judged. It is supervised by Robert Reis, right, who studied diamonds and gem cutting in Germany then worked in toolrooms and production shops in the Chicago area before joining Ford



**SIX-SPINDLE TURRET DRILLPRESS** is loaded prior to drilling, tapping, and countersinking series of holes in missile part. Saving is 45% over use of conventional drillpress and scrap is reduced. Using data provided in this article, an accurate estimate prior to machining minimizes cost and machine-load errors

**Technical Service Feature:**

# Estimating data for turret drillpresses

**For those shops equipped with turret drillpresses, here is an exceptionally detailed breakdown of production-time information—not elsewhere available. Prepared by the author of *Machine Shop Estimating*, it supplements similar data, on other machine tools, in that book. Methods, operations, materials are applicable to many conventional drillpress operations, found in practically every shop. Based on a standard hour, almost any job can be estimated. *And*, as an added service, additional data are available from *AMERICAN MACHINIST*. Just follow directions.**

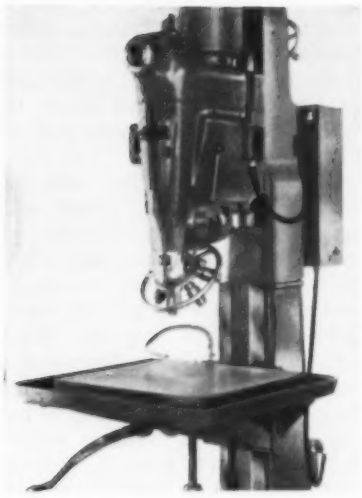
W A NORDHOFF, industrial consultant, LOS ANGELES, CALIFORNIA

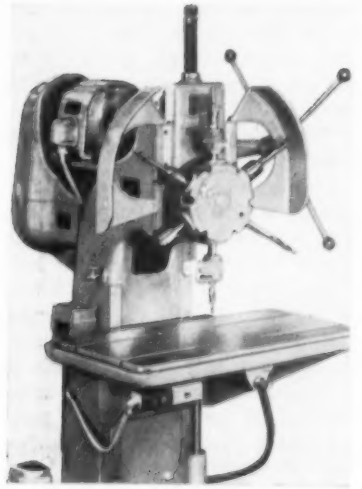
## More data free

**Certain material received by *AM* is valuable to only a limited number of readers, but to *them* it is very useful. However, it would be unfair to the disinterested readers to devote the pages necessary to supply full data on the highly special subject. Hence, *AM* will mail available tables and worksheets to readers requesting them within 60 (sixty days of this issue date. Information is free to subscribers; 50¢ per set to all others. Write Technical Service Editor, AMERICAN MACHINIST, 330 W 42nd Street, New York 36, NY**

The turret drillpress is distinguished from other drillpresses by having a turret head on which can be mounted several tools—one at each turret station. This turret makes it possible to perform a series of drilling operations on a part without repositioning the work. It is only necessary to index the drill turret. Indexing of the turret brings another tool into position in a manner similar to turret-lathe tools. Deviation of the tools from center is negligible.

The Model 2 manually operated turret drill occupies approximately 12 sq ft of floor space. (The same model hydraulically operated drill-





**TYPICAL TURRET DRILLPRESSES,** for the operation of which these data are collected and presented

press uses about 20 sq ft.) It is powered by a one- to two- horsepower motor and has a ¾-in. dia drill capacity. Spindle speeds vary from 200 to 4000 rpm. Feeds are manual on some models; hydraulic and infinitely adjustable on others.

Many drillpress jobs fall into a pattern of similar repetitive operations. Drill, countersink, and tap would be a typical pattern. Drill, counterdrill, spotface, ream, countersink, and tap would be another pattern. When such combinations do occur (which they do quite frequently), they can be executed with the minimum of motion and time between one cutting tool and

## TYPICAL TURRET-DRILL OPERATIONS

| OPERATION (ILLUSTRATED) | SCRIPTION OF THE OPERATION | DESCRIPTION OF ELEMENTS | ELEMENT TIMES |
|---|---|---|---|
| | Drill | Position work under spindle | 0.0010 |
| | | Advance tool to work (Drill) | 0.0004 |
| | | | 0.0014 |
| | Drill. (More than one hole, same plane, same size.) | Raise (clear) tool | 0.0003 |
| | | Move work to next position | 0.0006 |
| | | Advance tool to work (Drill) | 0.0004 |
| | | | 0.0013 |
| | Drill<br>Countersink<br>Tap | Install drill bushing | 0.0011 |
| | | Advance tool to work (Drill) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Remove drill bushing | 0.0011 |
| | | Advance tool to work (Countersink) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Brush oil on tap | 0.0020 |
| | | Advance tool to work (Tap) | 0.0004 |
| | | | 0.0066 |
| | Drill<br>Counterdrill<br>Countersink | Install drill bushing | 0.0011 |
| | | Advance tool to work (Drill) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Change drill bushings | 0.0022 |
| | | Advance tool to work (Counterdrill) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Remove drill bushing | 0.0011 |
| | | Advance tool to work (Countersink) | 0.0004 |
| | | | 0.0068 |
| | Drill. (From one hole of one size to a hole of a different size in a different plane.) | (Drill) | |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Clear work from under spindle | 0.0005 |
| | | Turn jig over | 0.0005 |
| | | Position work under spindle | 0.0010 |
| | | Advance tool to work (Drill) | 0.0004 |
| | | | 0.0030 |
| | Spotdrill<br>Drill<br>Spotface<br>Countersink<br>Tap<br>(Work done outside of a jig.) | Position work under spindle | 0.0010 |
| | | Advance tool to work (Spotdrill) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Advance tool to work (Drill) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Advance tool to work (Spotface) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Advance tool to work (Countersink) | 0.0004 |
| | | Clear tool | 0.0003 |
| | | Index turret | 0.0003 |
| | | Brush oil on tap | 0.0020 |
| | | Advance tool to work (Tap) | 0.0004 |
| | | | 0.0074 |

| SETUP ELEMENTS | Decimal Hours |
|---|---|
| 1. Time for the operator to sign in on a new job | 0.0167 |
| 2. Time for the operator to study the blueprint and the job instructions | 0.0167 |
| 3. Time to go to the tool crib and acquire the necessary tools for the job | 0.0833 |
| 4. Time to clean, check, and handle the drill jig prior to production use | 0.0250 |
| 5. Handling constant for each cutting tool used in the setup. (This is exclusive of the time to install the tool on the machine and to check its work—size, depth, tolerances, etc) | 0.0100 |
| 6. Handling constant for each measuring tool used in the checking of the work—plug gages, rulers, thread plug gages, etc | 0.0125 |
| 7. Clean table for setup | 0.0133 |
| 8. Adjust drill table for proper working height | 0.0167 |
| 9. Make necessary spindle speed selections and set knob controls (each) | 0.0042 |
| 10. Make necessary feed-stop adjustments (each) (Decimal tolerance depth.) | 0.0333 |
| 11. Install a drill chuck in a turret station | 0.0083 |
| 12. *Install a tapping unit in a station already occupied by a tool chuck | 0.0500 |
| 13. Install the following tools (Time includes adjusting the tool and checking its work): | |
| a. Countersink, centerdrill, spotdrill (each) | 0.0042 |
| b. Drill | 0.0267 |
| c. Reamer | 0.0500 |
| d. Tap | 0.0333 |
| e. Spotfacer | 0.0067 |
| 14. Deliver first part to inspection booth, or call inspector to inspect first part | 0.0117 |

*Tapping units can be installed in any and all turret positions.

the next. Just index the turret and the next tool is in position for work. Time—0.0003 hour.

Here is a detailed description of the turret drillpress elements of operation in their most common combinations:

1. Parts to be machined on the turret drill are first installed in a drill jig, in a vise, or just positioned on the drillpress table and held by hand. After the work elements have been completed, the part is removed from the drill jig or vise. The time on this combination of elements will vary with the size and the complexity of the part. Approximate times for the loading and unloading of fixtures are listed under operation elements.

2. After the holding device (vise, jig, fixture) has been loaded, the work is positioned on the table under the turret and the first tool is advanced to the work. The time for these elements is 0.0014 hr.

3. After the first tool has done its work: Raise tool into clear, index turret, advance next tool to work. Time—0.0010 hr.

4. Where four or five tools are installed on the turret, it is necessary to index past one or two open stations to complete the cycle of operation. Time to bypass one station is 0.0008 hr; the time to bypass two stations is 0.0016 hr.

(If only three turret stations are necessary to complete the operation, the other three stations should duplicate the setup to avoid the necessity of indexing past empty stations and, where only two stations are required for the job, three identical setups should be made.)

5. The time required to complete a full cycle—six stations—of the turret (exclusive of the machining time) is 0.0075 hr. This includes positioning the work under the spindle at the start of the cycle, clearing the last tool at the end of the cycle, indexing the turret to the "start" position, and clearing the work from under the spindle preparatory to the loading of the holding device.

If a tapping operation is included in the cycle, 0.0020 hr must be added to the time, to take care of "brush oil on tap."

6. When the part has been removed from the drill jig there will be left, in the jig, a residue of chips created by the drilling operation. It is usually necessary to clear these chips from the jig so the next part will locate properly. Chips left in the jig may destroy the locating points which are necessary to insure proper functioning of the jig. The time to "remove chips" is fairly constant with all forms of jigs used on this drill. There also seems to be little or no difference in the time whether the job is run dry, with a coolant, or with a lubricant. Thus, the time to blow jig clean is 0.0015 hr.

The time to blow a vise clean is 0.0005 hr.

The time to blow the drill table clean is 0.0010 hr.

7. It often is necessary to brush oil on a tap before tapping a hole to insure the proper cutting action of the tool. This is true for most materials. Usually, this is accomplished manually with a brush. It is a separate operation and is independent of the conventional coolant system. The time for this element is 0.0020 hr.

8. Drill bushings are installed in a drill jig to pilot, and to lend rigidity to, a drill during its initial stage of entering the work. A fixed bushing is built into the jig when it is only necessary to pilot one tool—a drill—in one position. But if it is necessary to pilot more than one tool—a drill, a reamer, a spotfacer—in the same position, removable, or slip, drill bushings are employed. Time is consumed by the operator in installing, removing, or changing these bushings. The times for these elements are:

a) Install bushing in drill jig, 0.0011 hr.

b) Remove bushing from drill jig, 0.0011 hr.

c) Change bushings in drill jig (one position), 0.0022 hr.

9. It may be necessary, for planning reasons, to set up to drill a part using only one turret station.

## OPERATION ELEMENTS

| | Decimal Hours |
|---|---|
| **A. MAKE-READY ELEMENTS** | |
| 1. Pick up part from work area, install part in drill jig. Release part from drill jig, remove part from jig, and aside with part to tote pan (work area). | |
| (a) Small jig | 0.0083 |
| (b) Medium size jig | 0.0130 |
| (c) Large jig | 0.0167 |
| 2. Pick up part from work area, position and install in vise. Release and remove part from vise and aside to tote pan | 0.0042 |
| 3. Pick up part and position on table. Aside with part to tote pan (No clamping of part.) | 0.0015 |
| **B. OPERATION (HANDLING) ELEMENTS** | |
| 1. Position work under spindle | 0.0010 |
| 2. Advance tool (in spindle) to work | 0.0004 |
| 3. Clear tool | 0.0003 |
| 4. Move work to next hole position | 0.0006 |
| 5. Turn jig over | 0.0005 |
| 6. Install drill bushing | 0.0011 |
| 7. Remove drill bushing | 0.0011 |
| 8. Index turret | 0.0003 |
| 9. Clear work from under spindle | 0.0005 |
| **C. OPERATION ELEMENTS (usual combinations)** | |
| 1. Position work under spindle, advance tool to work | 0.0014 |
| 2. Clear tool, clear work from under spindle | 0.0008 |
| 3. Clear tool, move work to next hole position (same plane), advance tool | 0.0013 |
| 4. Clear tool, clear work, turn jig over (to drill in another plane), position under spindle, advance tool to work | 0.0027 |
| 5. Install drill bushing; remove drill bushing | 0.0022 |
| 6. Bypass an empty turret station | 0.0008 |
| 7. Brush oil on tap | 0.0020 |
| 8. Change tool in drill chuck. (This element is used when more than one tool is used in the same turret station. Quick-change or Wizard drill chucks are used which allow the change of tools without stopping the spindle) | 0.0017 |
| 9. Blow jig clean | 0.0015 |
| 10. Blow vise clean | 0.0005 |
| 11. Blow table clean | 0.0010 |
| **D. ALLOWANCES** | |
| 1. Time to check each hole: a. Fractional | 0.0001 |
| 1. Time to check each hole: b. ±0.005 in. | 0.0002 |
| 1. Time to check each hole: c. ±0.0005 in. | 0.0033 |
| 2. Time to change from dull to sharp tools | See Table 4 |
| 3. Machine cleanup | 2% over-all |
| 4. Personal allowance | 5% over-all |
| 5. Fatigue allowance | 15% over-all |

Four spindle speeds are available for each of the six spindles of The Burgmaster #2 Model A turret drillpress. These spindle speeds are:

| Spindle Number | Speed A | Speed B | Speed C | Speed D |
|---|---|---|---|---|
| 1 | 3000 | 1500 | 1000 | 500 |
| 2 | 2000 | 1000 | 675 | 350 |
| 3 | 1300 | 650 | 450 | 225 |
| 4 | 3000 | 1500 | 1000 | 500 |
| 5 | 2000 | 1000 | 675 | 350 |
| 6 | 1300 | 650 | 450 | 225 |

All machining tables in this article are based upon this selection of spindle speeds. Spindle speeds on the Howe & Fant turret drilling machine are infinitely adjustable from 200 rpm to 4000 rpm on each of the six spindles.

**E. MACHINING ELEMENTS (specific operations)**

1. Centerdrill
2. Spotdrill
3. Drill
4. Ream
5. Taper ream
6. Spotface
7. Countersink
8. Tap

Detailed tables available upon request per instructions described earlier.

Although this is not the most economical use for this machine, work needs might require its functioning in this manner. When it is thus employed, we recognize these handling elements after the jig has been loaded: Position work under spindle (0.0010), advance tool to work (0.0004), raise tool into clear (0.0003), clear work from under spindle (0.0005). The total time for these elements is 0.0022 hr.

10. Many hole patterns are made up of the same size holes. These holes may be in the same plane or they may be in other planes. Where they are in the same plane, the tool is cleared, the work is repositioned for drilling the next hole, and the tool is advanced to work. The time consumed by this combination of elements is 0.0013 hr.

11. The hole pattern of a part may have the same size hole (or holes) in another plane. Then we have the following combination of elements: Clear tool (0.0003), move work into clear (0.0005), turn jig over (0.0005), position under spindle (0.0010), advance tool to work (0.0004). The total time for this group of elements is 0.0027 hr.

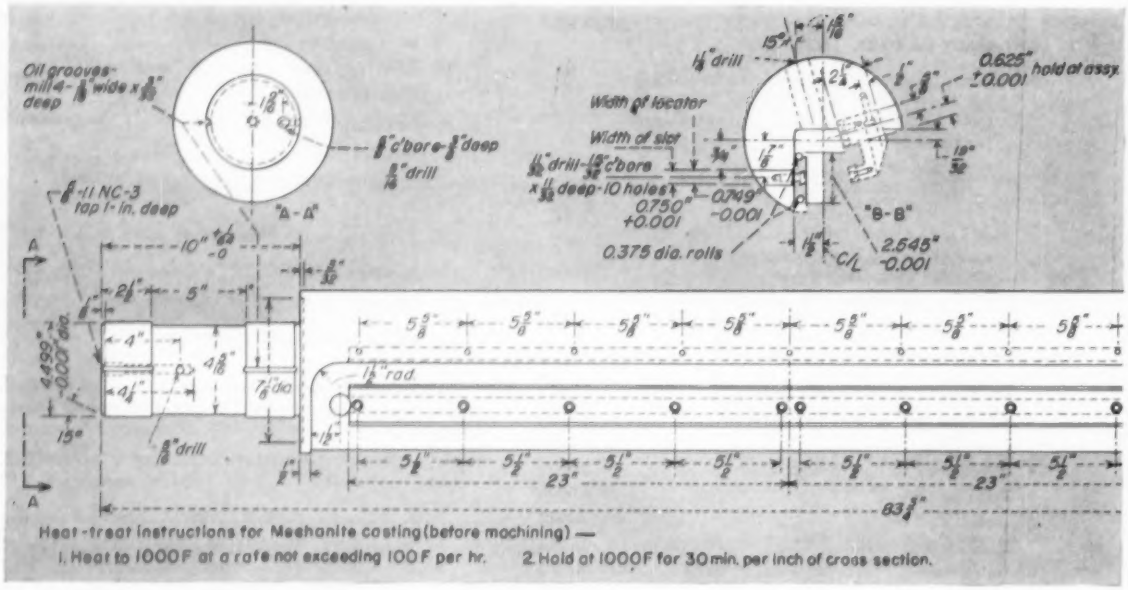
(If more than one hole of the same size is drilled in this other plane, we go back to the elements listed in *10* above.)

In neither of these cases—10 nor 11—will the turret be indexed.

***table 4 . . TOOL SHARPENING ALLOWANCE PERCENT OF DRILLING TIME***

| | MATERIALS | | |
|---|---|---|---|
| Drill Size | Aluminum Brass Magnesium | Mild Steels | Hard Steels |
| 1/16 and under | 10% | 20% | 30% |
| 3/32 to 1/2 | 7.5% | 10% | 20% |
| Over 1/2 | 5% | 7.5% | 10% |

*Based on 0.050 hr to change and sharpen a drill.*




DETAIL OF BAR DESIGN

# Cammed contour-boring bar cuts cutting time 1/3

**Profiling cam in bar instead of on machine.**

**Bar rigidity and revolving pilot reduce vibration.**

**Tool set to direct micrometer reading, hence high repetitive accuracy.**

**Minimum of operator skill required.**

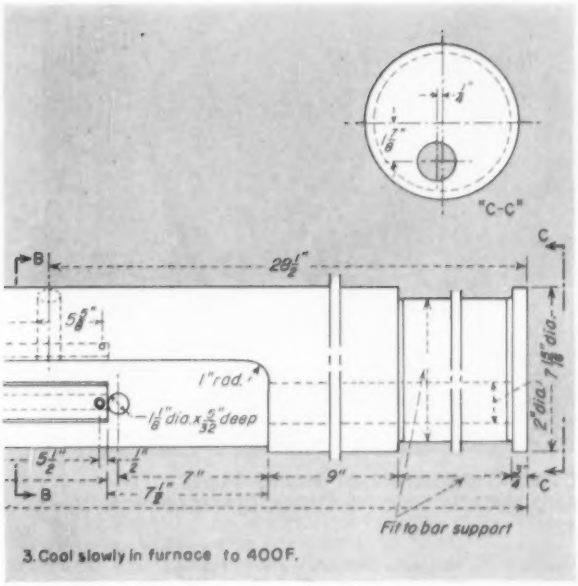
**Accurate setup within a few minutes.**

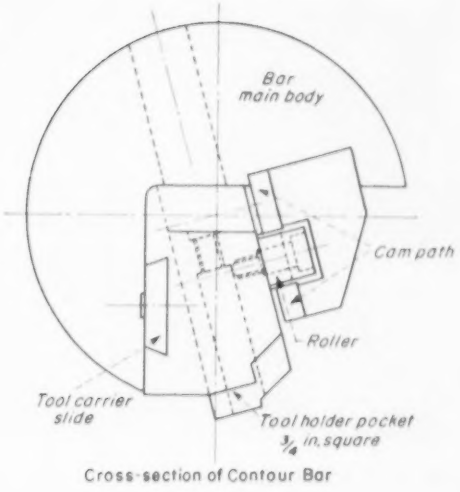
**As an industrial-preparedness measure,** a number of manufacturing methods are being studied, developed, and evaluated at Watervliet Arsenal. Detailed reports are prepared to describe each project. This method was developed for machining the powder chamber in the "8-in. Howitzer —M2". It is equally practical for many other jobs where contour bores exceed 3½ in. Another report (AM—Aug. 13 '56, p 120) describes tooling with gun drills for small parts and shallow holes.

All conventional methods for producing internal contours have limitations, either because of high maintenance costs, inaccuracy of operation, or the length of time necessary to complete the operation. Industry needed a tool which would both remove stock rapidly and assure sufficient accuracy so grinding efficiency would not be impaired.

We received information that the Hughes Tool Company, operators of the Dickson Gun Plant, Houston, Texas, had designed, and used in production, a new contouring bar. Study of the drawings showed that this bar embodied several sound machining principles, also that its design could be adapted to bores of various sizes. After more thorough study, several modifications were made. To expedite experimentation, a contour bar of similar design was made at this Arsenal.

The major difference between the bar made at the Arsenal and

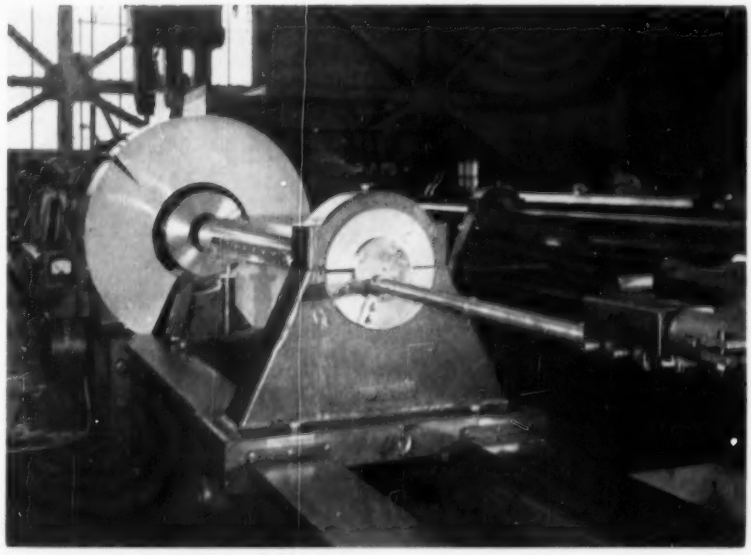



**CROSS-SECTION OF BAR**

**1 . . Main body of contouring bar** was machined from Meehanite casting (furnished by Dickson Gun Plant). A 90° segment was milled out along the length of the central portion. On one side of this cutout a dovetail is mounted to serve as a carrier for the toolholder. Opposite side has a milled pocket into which the cam is fastened. Roller mounted on top of the toolholder is positioned in the cam path to direct the tool along the proper contour. Feed is delivered to the tool holder by a feed bar which is fastened to the toolholder at one end and to a standard boring bar at the other end

E J INGLIS, project leader
MILLARD T DOUGLAS,
technical writer
Manufacturing Methods Section,
WATERVLIET (NY) ARSENAL



**SETUP ON BORING LATHE**

the one used by the Dickson Gun Plant is that the former incorporates a positive cam path for tool direction, whereas the latter contains a single-sided cam plate dependent upon mechanical springs to maintain proper contact with the roller.

The completed bar was mounted in a standard bar support on a LeBlond No. 7 hollow-spindle boring lathe. A steel forging, 14 in. in dia, was used as a test piece. A total of five 8-in. howitzer tubes were later machined, and test data are based on those results. Because existing orders terminated, no application was made on a production basis. However, there is every reason to believe the bar practical.

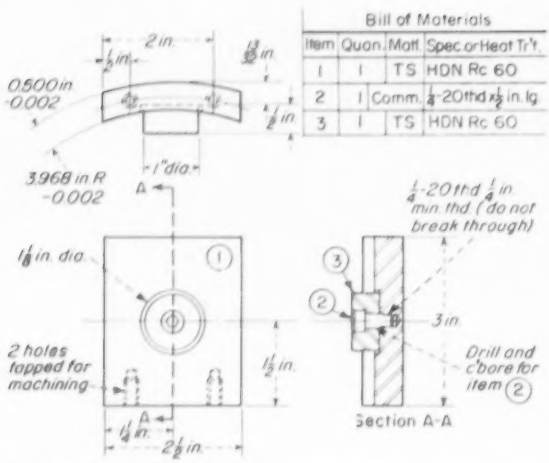
### CUTTING TOOLS

Square-wafer, carbide insert tools were used, and these tools proved especially satisfactory because proper tool location is maintained when changing tools simply by indexing a new cutting edge.

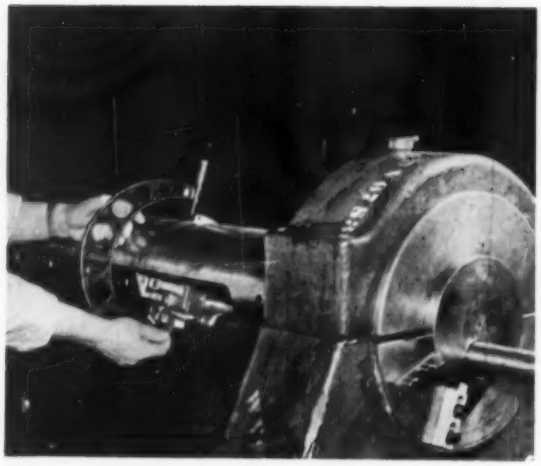
The initial cost of inserts is so low that no tool regrinding was done. It proved more economical to discard the inserts after all four cutting edges had been expended.

As described earlier, the completed bar was mounted in a boring lathe. Because no provision has been made to re-spot the muzzle end and finish face the breech end, which is the normal procedure in powder chamber operation, this machine does not appear to be suitable for production quantities.

## Cammed contour boring bar . . .


Bill of Materials
Item | Quan. | Matl | Spec. or Heat Tr't.
1 | 1 | TS | HDN Rc 60
2 | 1 | Comm. | ¼-20 thd x ½ in. lg
3 | 1 | TS | HDN Rc 60
2 in.
½ in.
⅝ in.
0.500 in. -0.002
½ in.
3.968 in. R -0.002
1" dia.
A
¼-20 thd ¼ in. min. thd (do not break through)
1⅛ in. dia.
2 holes tapped for machining
1½ in.
3 in.
Drill and c'bore for item (2)
Section A-A
1½ in.
2½ in.

DETAILS OF SIZING PLATE



CORRECT POSITION OF SIZING PLATE AND MICROMETER TO CHECK DIAMETER

**2 . .** **Sizing plate** was added to simplify setting tool to it predetermined size for each cut. Former practice was to set tool diameter by adjusting a backup screw through a 1¼-in.-dia hole in the bar; then move holder forward to clear hole so that micrometer could be used to check each setting. Because several measurements were usually needed to attain the correct diameter, this system was time-consuming. The "sizing plate" contains a plug which is inserted into the tool-setting hole. Thus, a micrometer reading can be taken without moving the tool-holder

"PORCUPINE" ROUGHING REAMER

FINISHING FORM REAMER

**5 . .** **Reaming** is one of the common methods of machining powder chambers. Porcupine reamers are so named because of their appearance. These reamers are pilsted and contain several single-point tools located at various intervals. They are usually used in a standard boring lathe to produce a series of counterbores that approximate the desired profile. However, contouring by some other means is necessary to finish the chamber.

Form reamers are equipped with high-speed steel blades which are ground to the exact contour desired. Normally, they are used in a turret lathe after the chamber, or contour, has been roughed by some other means. Because of the large blade area in contact with the work, only very slow feeds and speeds will produce satisfactory work. Manufacturing and maintenance costs for this reamer are very high

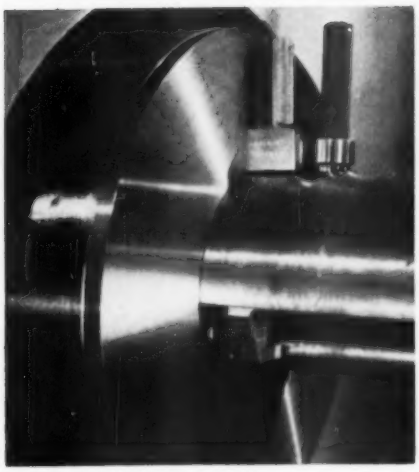
However, by machining these extra operations in a turret lathe, this lathe did enable us to prove the practicability of the contouring bar.

The bar was tested at 160 sfpm and a feed of 0.017 ipm. Estimated times for the sequence of operations necessary to machine one piece are: Load and unload—23 min; setup—21 min; rough gas-check seat—8 min; rough entire chamber—36 min; finish entire chamber—36 min. Total time—124 min.

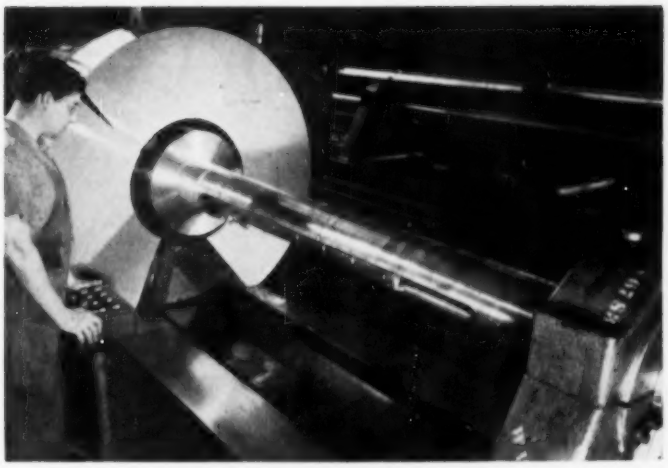
However, for an accurate comparison, the loading setup, respotting, facing, and unloading done in the turret lathe must be added. Preparatory time amounts to 96 min. Actual total time is 3.66 hr. Present time for this entire job is 5.56 hr, hence using the contour bar saves 1.90 hr per piece, plus a better quality job and a saving in grinding time. We believe that this job can be done in 3 hr.

### FINAL RESULTS

1. Actual cutting time required to complete the operation using a contouring bar is 1 hr, 50 min, as compared to 2 hr, 53 min using



**3 . . Set of depth blocks** was made to insure proper longitudinal depth for each cut. Blocks are marked for the depth to be cut. When inserting the bar into the tube bore, the proper block is set between the external work face and a plug which was made to fit the tool-setting hole. Replacing the former scale measuring of the distance, this system has proved a quick and easy method of establishing bore depth to within 0.002 in. This accuracy is important as depth and ID combine to determine the amount of grinding needed later on—and grinding is expensive



**4 . . Pilot and boring bar** in correct position for entering tube. After each cut, except the last one, bar is returned to this position. After last cut, bar is removed from work and work is removed from machine. Coolant is always turned on before cut is started. As a further refinement, for production, bar can be mounted in a turret lathe

the present contour-boring method.

2. In production, more uniform distribution of the grinding stock made possible by the use of this bar will improve grinding efficiency.

3. A bar of similar design is being considered for use in setting up pilot lines for tubes of the large or middle class.

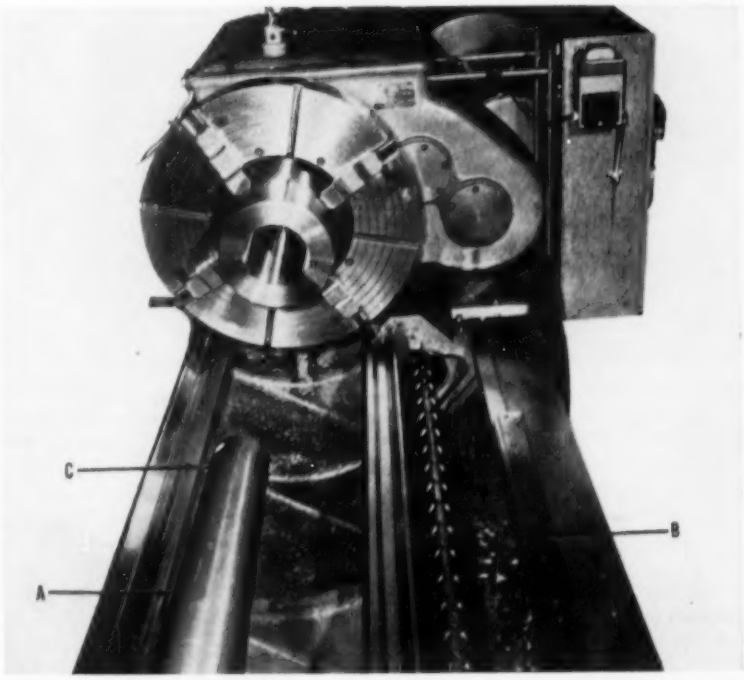
4. Investigation is being continued to engineer versatility into the contouring bar's design, which will permit the bar to be used for machining several sizes of tubes by simply interchanging cams and pilots.

### LIMITATIONS

1. Present bar design does not seem practical for use on bores smaller than 3½ in.

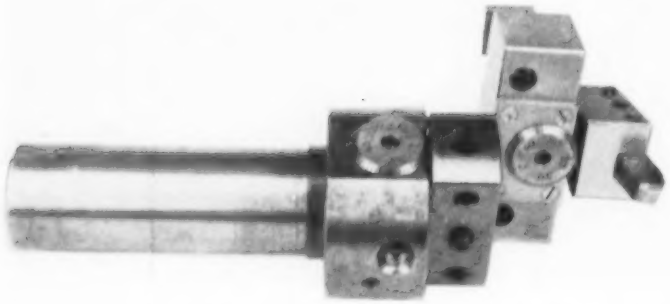
2. It would not be economical to manufacture a bar of this design, unless more versatility can be achieved, for use on small quantities of tubes.

*Ed note:* This design may also prove practical for use in a vertical setup using a boring mill or, with modification, in a radial drill.

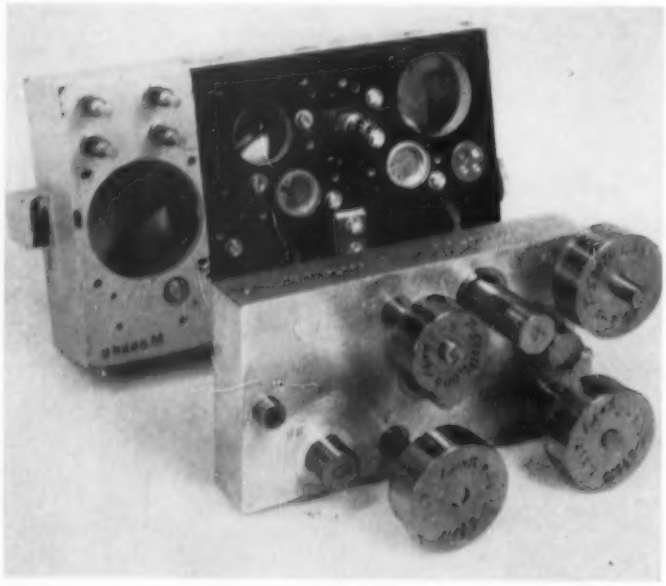



**6 . . Conventional contour boring** usually is done in a turret lathe. A boring bar of the proper length, equipped with a single-point tool, is mounted in a turret station and is guided by a cam plate mounted on the rear of the machine. Slenderness of bar provides very little rigidity to the carbide cutting tool. Accuracy depends upon locating tube in relation to cam plate. The heavier the tube, the more difficult is location. (A—Boring bar, B—Cam plate, C—Single-point tool)

# Ingenious tooling cuts costs



**BORING SLIDE** and tangent-turning tool utilize standard components with vernier adjustment in increments of 0.001 in. that permits operator to maintain accuracy in size and concentricity essential for finishing operations



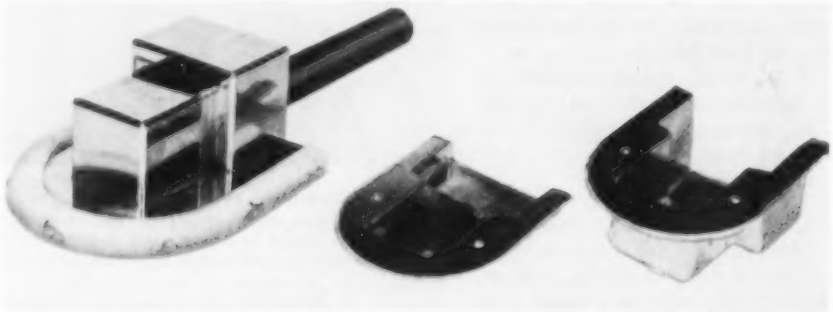
**SERVO MECHANISM** (rear) requires precision setting of gear centers to control backlash. Simple plate fixture (front) has steel pins to permit presetting to control backlash within C and D mesh requirements

**Standardized tooling setups on Bore-Matics and Perf-O-Matics reduce break-even points to 50 pieces; fusible-alloy molds cut plastic-molding expense; plastic metals make cheap drill jigs**

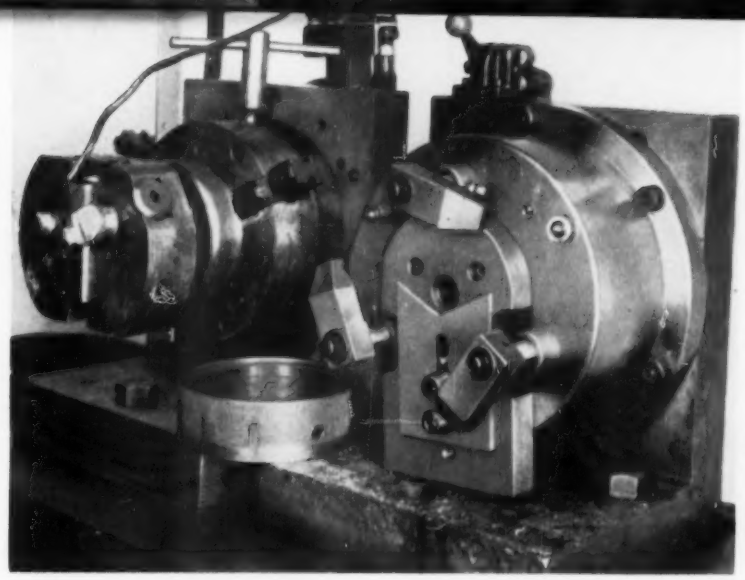
JOSEPH W PULIS, tool eng'rg dep't
ARMA DIVISION,
AMERICAN BOSCH ARMA CORP
GARDEN CITY, NY

Much of Arma Division's production is on a prototype, or model-shop, basis, so it is not unusual to have job lots of 50 or less on barstock pieces. Normally, setup time and tooling cost would prohibit the use of such high-production machines as the New Britain #126 (Perf-O-Matic) automatic turret lathe, but the use of standard accessories available from the machine manufacturer, plus special Arma-designed boring slides and tangent-turning tools, have made it profitable to schedule short production runs. These toolholders have allowed the use of economical flat form tools, which have the added advantage of simple maintenance.

On high-precision boring, facing, and turning operations with tolerances on size generally running 0.0003 in. TIR on both OD and ID, and concentricity and perpendicularity to be maintained within the same or smaller limits, it has been found best to utilize multiple-bit construction. An Arma-designed adjustable toolholder with a small stock of



**POLISHED ALUMINUM PATTERN** (left) has handle to permit easy dipping in fusible alloy. Two halves of mold (right) are then stripped off and used for casting plastic workpiece. Mold is used only once then remelted, so no cleaning is required. Horseshoe on pattern is plastic clamp to act as dam



**ADJUSTABLE TOOLHOLDER** (left) on Bore-Matic permits high-precision boring, facing, and turning within 0.0003 in. TIR on OD and ID. Locating fixture (right) attached to air chuck has adjustable V-block for fast positioning of gear blanks for boring center hole

toolbits has been found flexible enough to accomplish almost 95% of shallow-piece production with no special tooling. This, coupled with the slow feeds available on the Bore-Matic, makes the assignment of much high-finish work to this type of equipment desirable.

Each two-spindle Bore-Matic is equipped with one soft-jawed, air-operated chuck and one arbor or fixture adapter for holding work. The same fixture adaptation is on the faceplate of each engine and bench lathe, reducing the cost of tooling for second-operation finishing and, incidentally, permitting interchange of production between Bore-Matic department and the Lathe department.

Use of a locating fixture incorporated into a Woodworth three-finger (clamp type) air chuck has enabled another Bore-Matic to be adapted to rapid boring of small-lot quantities of precision gear blanks in many sizes. Setup time for adaptation has been reduced to an average of 4 min, including trial cuts.

### NEW MATERIALS PAY OFF

Arma has also found that a comparatively small time investment in investigating the potentialities of new materials and processes will consistently result in lowering tool costs, and this, in turn, will result in a substantial lowering of production cost and, perhaps even more important, decrease some of the imponderables — the hidden costs.

A typical situation of this type occurred when, in attempting to solve the production problem on molded components, we tried a radically new approach to molding. The established method had been to make an aluminum mold, usually to fairly critical dimensions and with a high polish in the cavity, load the mechanical component in the mold, pour in the molding compound, and cure it in the mold. The mold would then be stripped from the component, be cleaned, and ready for reuse. The cleaning operation took upwards of 1 hr.

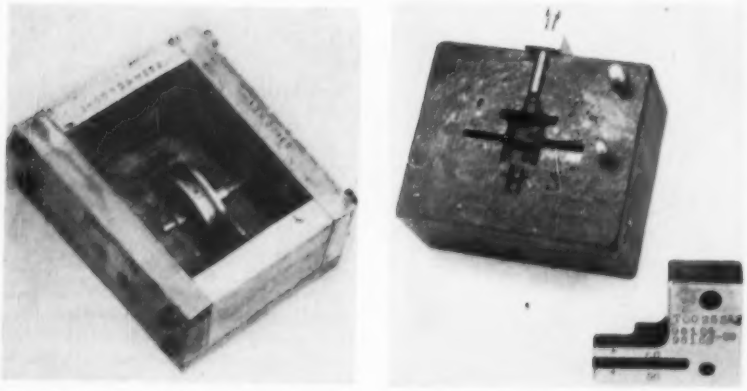
As weight reduction for airborne components became more and more important, their basic rectangular shape was no longer satisfactory, and the molds became increasingly complex. This, and the cycle time, began to create a problem in tool procurement, storage, and maintenance. Each time the production schedule was stepped up, more molds were required, and the time required for cleaning increased tremendously.

We had been investigating the possibilities of several types of materials for replacing the aluminum molds, when a piece of polished aluminum was thrust into a solder pot; upon withdrawal, it was found that a female duplicate could be slipped off the aluminum piece. From this basic discovery, the "fusible-alloy mold reproduction" grew. By using a basic pattern that duplicates the workpiece, it has been possible to make one pattern, no matter how complex, that can produce an unlimited number of molds ready for the production line.

The obvious reduction in tool cost by making one pattern instead of many molds justified the process immediately, but the bonus lay in the fact that one of the imponderables had been eliminated. With this process, it was no longer necessary to clean a mold after each cycle; it was cracked off the component and remelted. Another incidental saving was the elimination of the tool-storage problem. We now store one pattern instead of many molds.

### CUT ASSEMBLY COSTS

Assembling small electromechanical servo units has traditionally been an area of minimum tooling; primarily because of the complexity and quantity of tooling required for even the simplest units. The two basic mechanical operations that require the largest expenditure of assembly time are the setting of gear meshes for proper backlash, and the assembly of the gears and axial limit stops to the shafts. When a typical servo has approximately nine gear centers, the quantity of tooling required, if



**PLASTIC METAL** holding fixture (right) is cast in breakaway mold over aluminum dummy assembly (left). Simple drill plate is added (lower right) to permit accurate drilling for positioning gears on shaft

### Ingenious tooling . . .

conventional tools are used, can be astronomically expensive.

The first problem to be investigated was setting gear centers for proper backlash. The time-honored method had been to work away from the fixed centers, adjust the component adapters, set an indicator on one gear tooth, and check. As we maintain consistent gear runout to 0.0002 in. or less, it was felt that settings could be predicted, and a flat plate fixture, with pins duplicating the gear centers, would permit presetting each servo for proper backlash. A trial tool proved this practicable, and now it has become a standard procedure to tool for backlash.

The second problem was the axial setting of gears on shafts. Most shafts are 3/16 in. in dia and gears often are 2 in. or larger on PD, so a holding fixture to position three or more of these gears on a shaft only 1½ in. long, and allow it to be drilled for pinning, presents quite a problem in tool engineering.

Here again, investigation of new materials paid handsome dividends. The success we had attained with the fusible-alloy mold-reproducing process led to the manufacture of an aluminum dummy duplicating the assembled gears and shafts. This dummy was split on the center, fastened to the bottom of a breakaway casting box and the box filled with one of the new plastic metals, a metallic suspension in a hardenable plastic liquid. After curing, the box and dummy are removed, and there is the complete holding fixture, requiring only the addition of a drill plate to complete the assembly tool. If more than one fixture is required, the process is repeated. In this case, there was the double saving: the cost of the tool was lowered, and production cost was substantially reduced.

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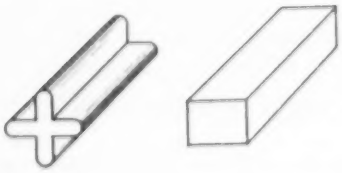
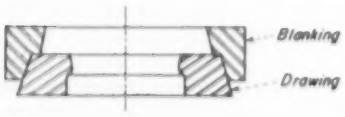
# Diemakers Kinks

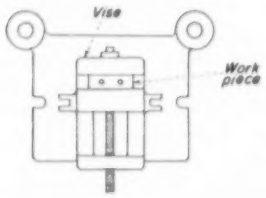
FEDERICO STRASSER



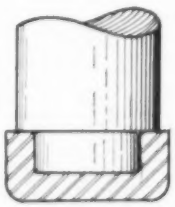
**SPACING BLOCKS** should always be employed during diesetting to avoid injury to the man or the tool. These blocks are conveniently made of aluminum, either rectangular or an extruded section (if stable) or of wood.



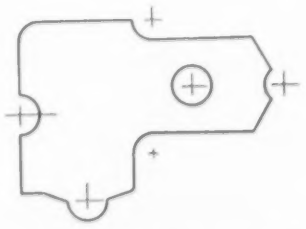

**TO AVOID** cumbersome modifications in a solid combination blanking and drawing die, make the item in two parts. Then if you have to alter either ring, or even make a new one, time and material are saved. The two-part construction is also advisable in a combination draw and redraw die.




**WHEN NARROW STRIPS** of heavy stock are pierced, the spreading action of the punch may impede removal of the part from a die nest. In such cases replace the nest with a vise, powerful quick-acting clamp, or air-operated clamp. It is not good practice to open up the nest, because location of the pierced holes will be adversely affected.



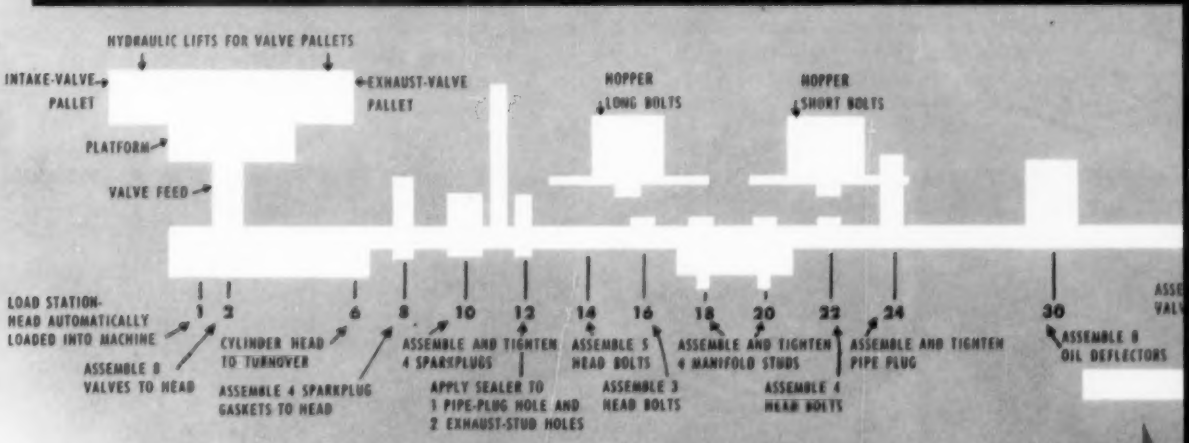
**A TOOL-STEEL TIP** on a large drawing punch saves expensive material as compared to solid construction, and can readily be replaced.



**TOOL-STEEL** templets embodying a variety of radii and circles are useful to the diemaker.

American Machinist
SPECIAL REPORT NUMBER 430

▲ 137-FT MACHINE ASSEMBLES V-8 CYLINDER HEADS AUTOMATICALLY, INSTALLING . . .




**Components . . .**
are loaded automatically in the Oldsmobile machine — from one side only — none are put directly into feed hoppers. Stock is placed in bulk-handling devices, then loaded into vibratory-bowl and other feeders where level is automatically controlled. Parts assembled include intake and exhaust valves, sparkplugs, head bolts, manifold studs, pipe plugs, oil deflectors, valve springs, retainers, and valve keys. For flexibility and high efficiency — without banking or storing—the machine is backed up with portable tools and manual stations. Special air tools operate automatically and can be removed without wrenches, or disconnecting air lines. There is an auxiliary drive if the transfer mechanism fails.

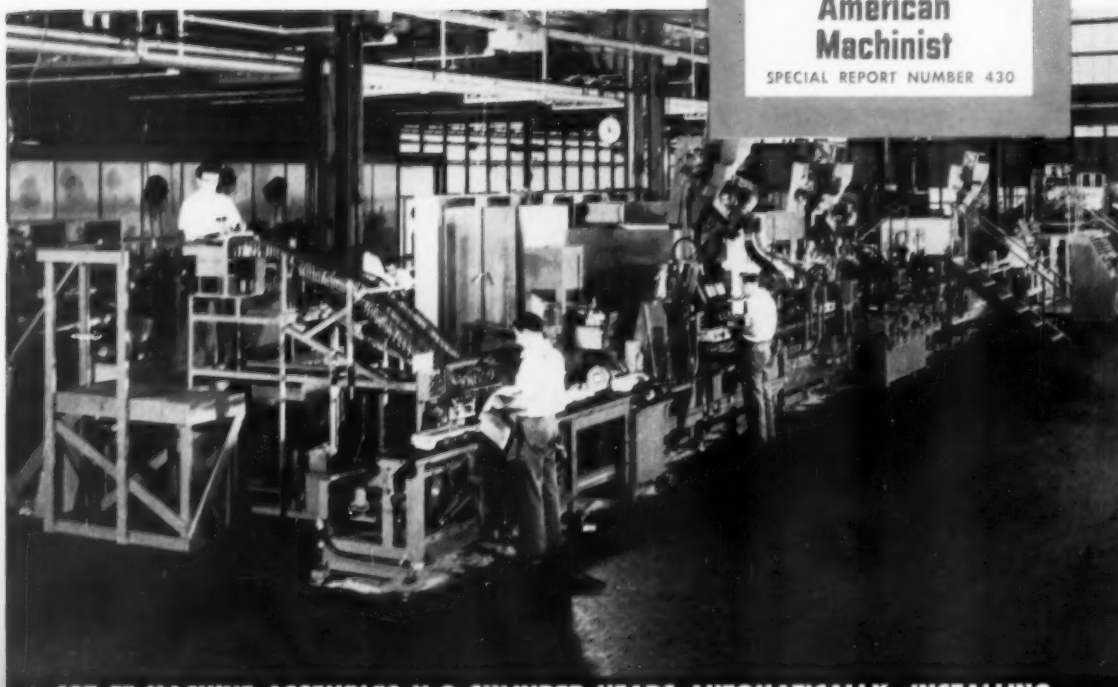
GEORGE H DEGROAT
associate editor

# Automatic Assembly . . .

## THE LATEST

**Current trend in Metalworking is toward automatic assembly of products, ranging all the way from small electric motors to auto engines. Manufacturers are going beyond the simple assembly of a few components as part of a machining operation. Now they want fully automatic machines.**

American Machinist
SPECIAL REPORT NUMBER 430



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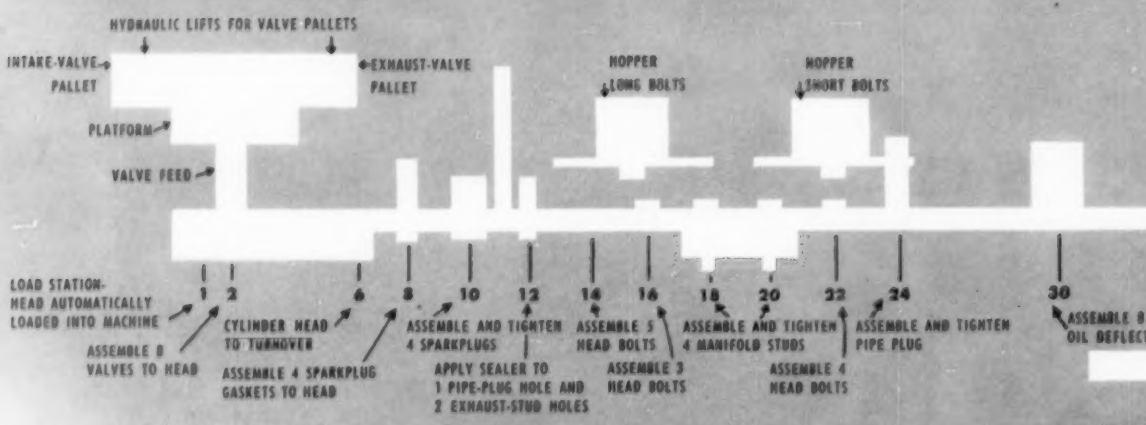


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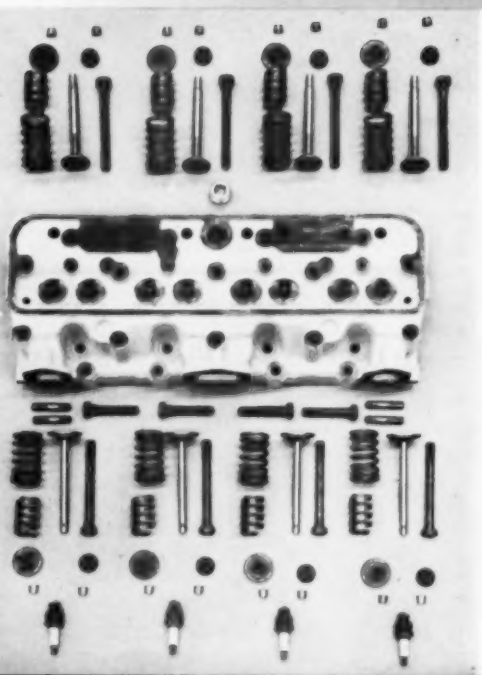


## Typical assemblies made automatically . . .

CYLINDER HEAD • ENGINE BLOCK

TORUS RING • RADIO RECEIVER

REED SWITCH

PUMP COVER BEARING

FOOD-CANNING INDICATOR

PRESSURE GAGE • AMMETER FRAME

RADIATOR CAP • VACUUM VALVE

TIE-ROD SOCKET • ROLLER-SKATE WHEEL

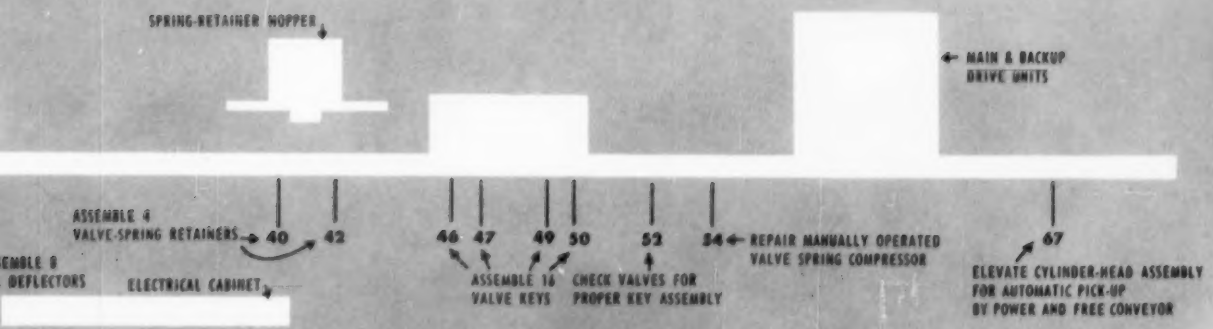
DISTRIBUTOR CAP • MOTOR END SHIELD

BRAKE PISTON SEALS

EXHAUST MANIFOLD • WATER PUMP

. . .

▲ THESE PARTS, MORE THAN 70




. . .

## TEST IN AUTOMATION

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Along with many advantages, there are stiff requirements to be met before automatic assembly can be applied economically. In following pages are described some of these problems and advantages, together with examples of the automatic machines now in operation, how they work, what they put together.

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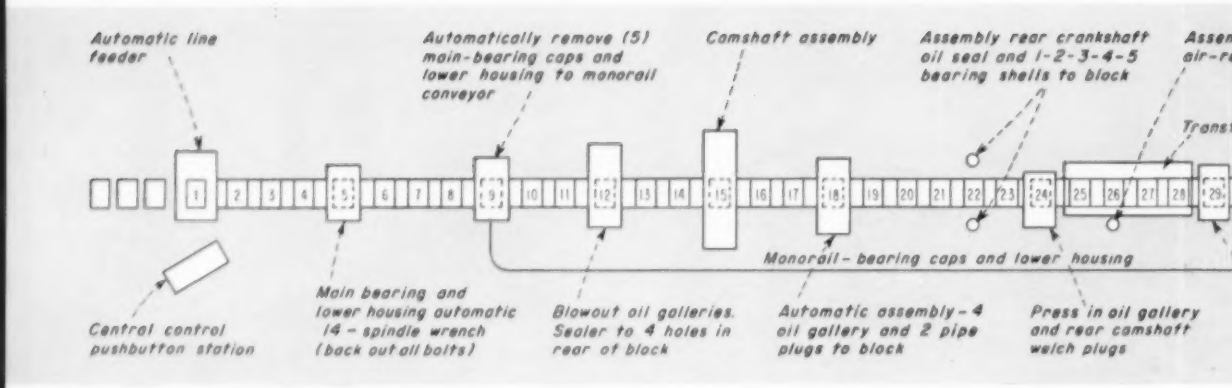
## Automatic Assembly...

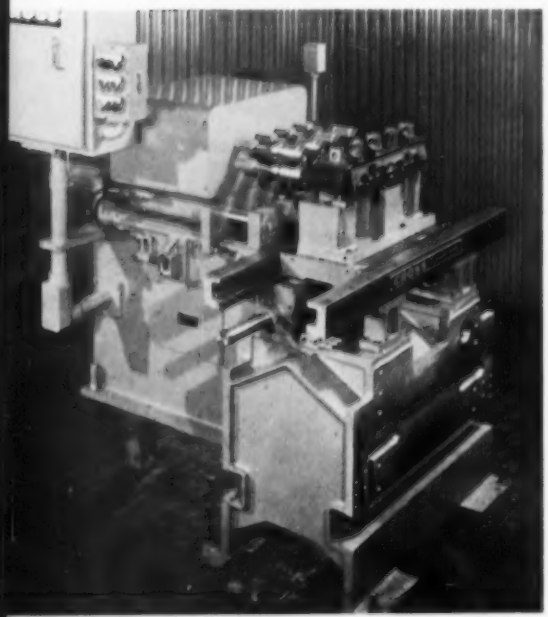
THE LATEST IN AUTOMATION


Automatic line feeder
Automatically remove (5) main-bearing caps and lower housing to monorail conveyor
Camshaft assembly
Assembly rear crankshaft oil seal and 1-2-3-4-5 bearing shells to block
Monorail - bearing caps and lower housing
Central control pushbutton station
Main bearing and lower housing automatic 14 - spindle wrench (back out all bolts)
Blowout oil galleries. Sealer to 4 holes in rear of block
Automatic assembly - 4 oil gallery and 2 pipe plugs to block
Press in oil gallery and rear camshaft welch plugs

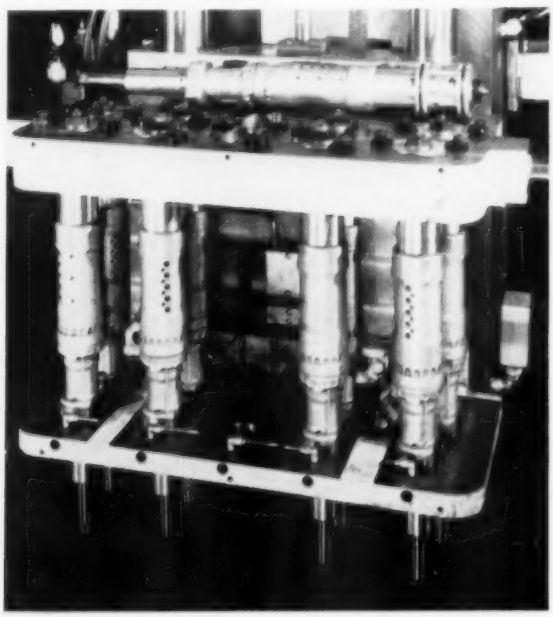
# NEXT LOGICAL STEP: *Automatic*

Latest stage in the evolution of automation is automatic assembly. Present indications show more and more interest in carrying automatic operations beyond machining and other processes, through the final manufacturing operation—assembly.

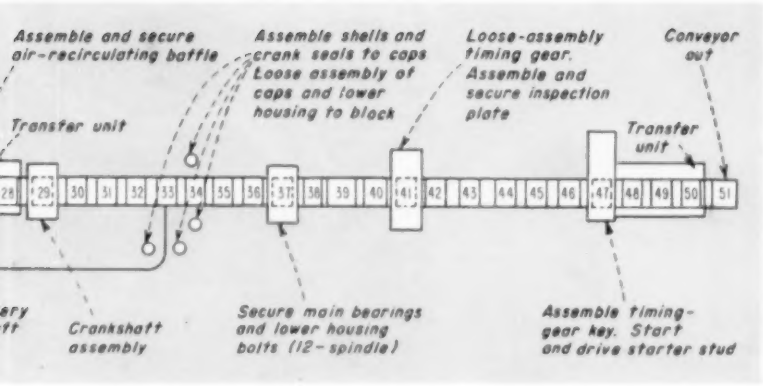
At the same time, machine builders are thinking well beyond the design of familiar equipment that assembled a few components as part of a machining operation. For example, one builder (National Automatic Tool Co.) has gone from such simple machines as one that cut, formed and inserted a piece of brazing wire and a piston pin into a small refrigerator component, to develop complicated equipment for assembling an auto engine block. This par-



**Unit construction provides flexibility . . .** in Plymouth's cylinder-head assembly equipment. Mechanical interlocks permit easy removal or replacement of units, and machined pads are provided for possible addition of extra heads at each station. Tracks under right-hand section return pallets



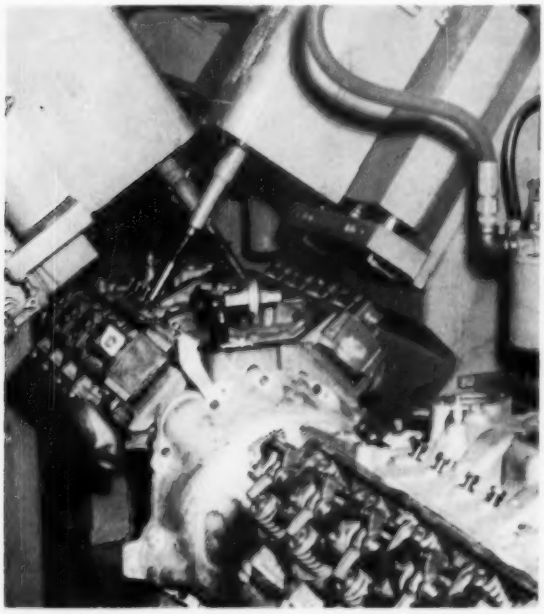
**Standardization is achieved . . .** to some degree, with this Cross nut-running station on the Plymouth engine-block assembly line. Several makes of air-operated torque wrenches fit into the manifold shown, are easily removed for replacement or repair. Automatic lubrication of spindles is provided, too




**Machine-tool construction . . .** is used in engine-block assembly equipment. This Natco machine includes a heavy cast bed with ways, indexing mechanisms and locating stations. Unit pads have been provided for adding the assembly mechanisms or units as the customer desires. Design of this unit has followed closely the design of a machine-tool and not a conveyor mechanism. The bed is of heavy cast construction with very accurate locations. Parts (51 in all) are indexed from station to station, located and securely held while the assembly operations are being performed

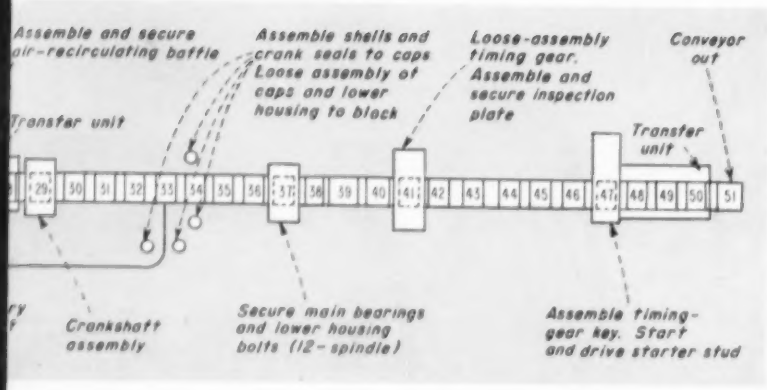
# *Assembly*

ticular machine removes five main bearings, (previously assembled for boring operations) blows out the oil-gallery holes, applies sealer to four welch-plug holes, installs the camshaft, presses in the four welch plugs, inserts two pipe plugs, assembles the rear crankshaft oil seal and five main-bearing shells, presses in the oil gallery and rear-camshaft welch plugs, assembles the air recirculating baffle, inserts the camshaft, assembles shells and crank seals to caps, loose-assembles caps and the lower housing, secures the main bearings and housing bolts, loose-assembles the timing gear and inspection plate, and finally installs the timing-gear key and starter stud in the engine block.



**Proper sequence is important . . .** to insure correct torque in running intake manifold bolts on this Plymouth engine block. Instead of running 16 bolts at once, the heads tighten two or three at a time. Four units are located on each side of the line, each handling as many as is practical for good results

**Special hoppers feed . . .** valve-spring locks to Plymouth cylinder heads for automatic assembly. Locks are oriented before positioning—springs are compressed and eight locks inserted in four valves at a time, two at each valve. Intake-valve spring locks are handled in the right-hand unit, those for exhaust valves in the second


Assemble and secure air-recirculating baffle
Assemble shells and crank seals to caps
Loose assembly of caps and lower housing to block
Loose-assembly timing gear. Assemble and secure inspection plate
Conveyor out
Transfer unit
Transfer unit
Crankshaft assembly
Secure main bearings and lower housing bolts (12-spindle)
Assemble timing-gear key. Start and drive starter stud

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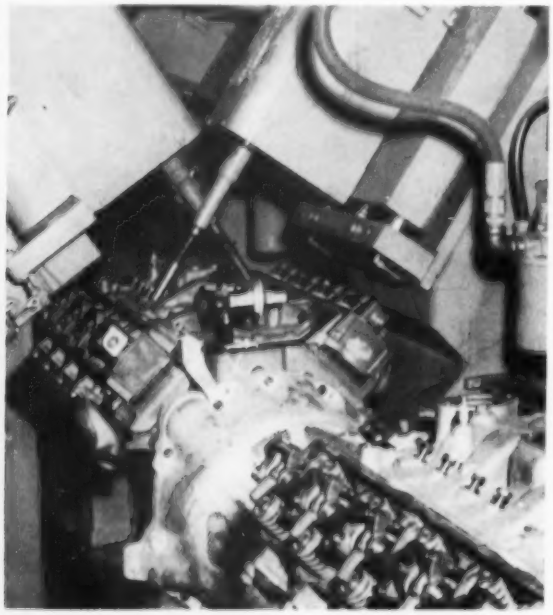

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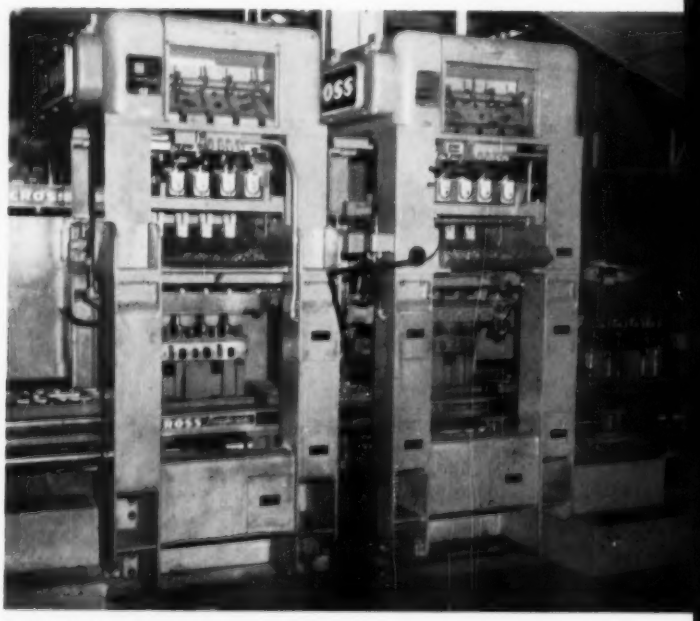

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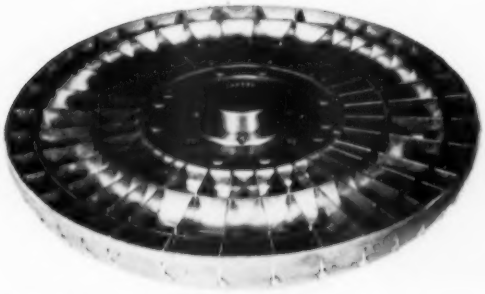
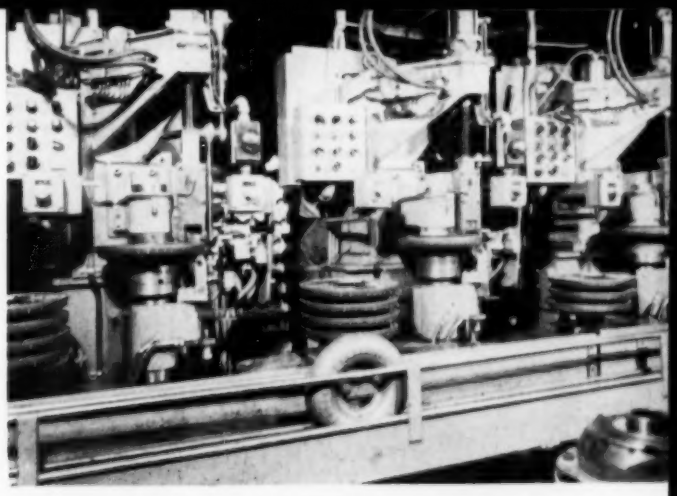
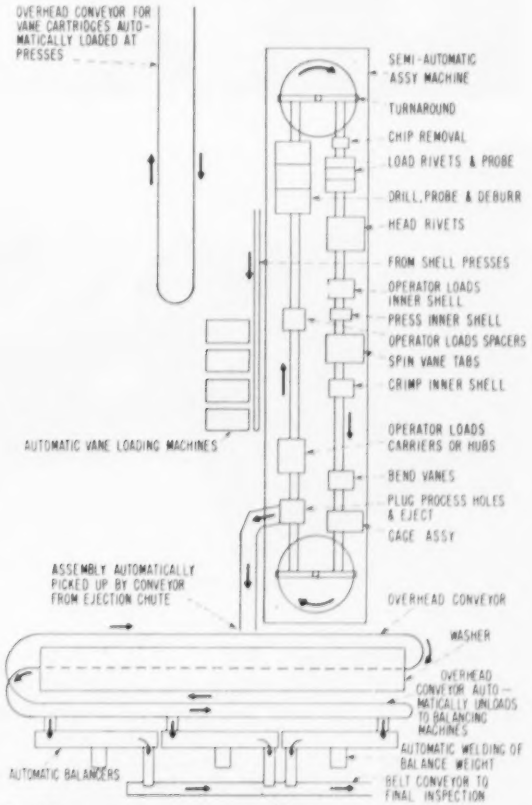


**Irregular spacing of vanes . . .**
in this automotive-transmission main turbine complicates automatic assembly. Close cooperation between product engineers at GM's Detroit Transmission Div and machine designers in the Process Development Staff resulted in modifications in this 12-in.-dia part that insured successful assembly. For example, vane design was changed slightly to eliminate an awkward motion required for their assembly into the main shell. Dimpling the vanes after installation was also simplified by keeping the number of dimples to a minimum, and rearranging assembly dimensions simplified an electronic gaging station

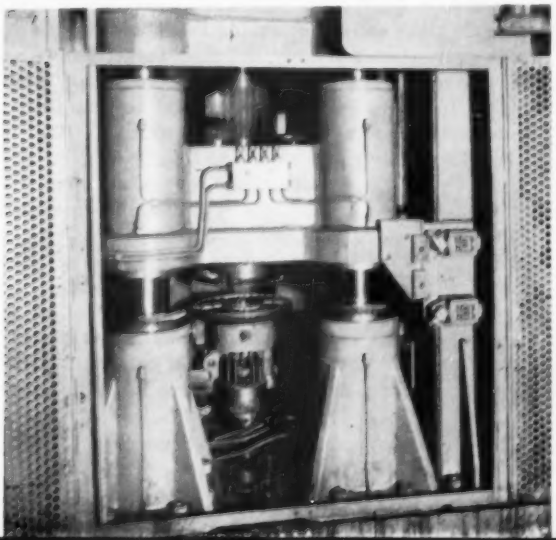


**Vanes are automatically assembled . . .**
in shells prior to delivery to main assembly machine. Conveyors bring torus shells and cartridges—each containing 36 vanes—to these four machines—from stamping presses where they are made. Location of vanes in the stells is handled by shot bolts for registration

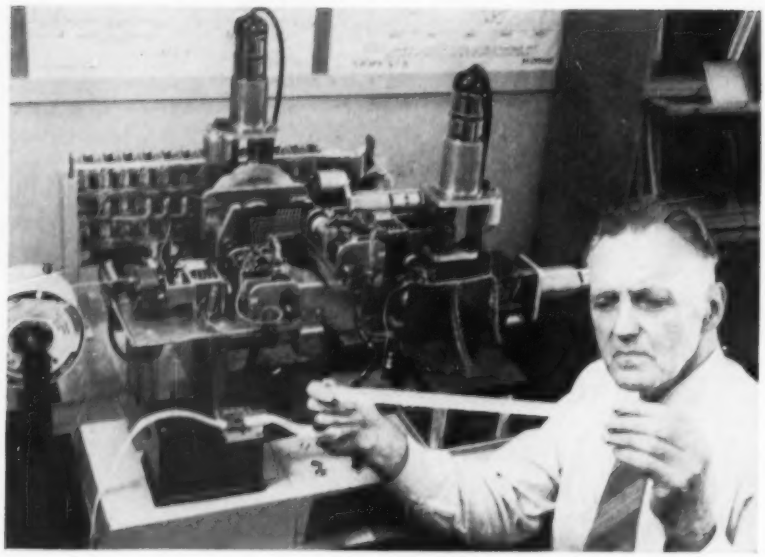
**Loading is automatic . . .**
at the torus assembly machine after vanes have been installed in shells. By careful planning, assembly problems were reduced to small, individual elements capable of solution in this progressive straight-line machine. Efficient use of operators—where necessary—insures economy of operation



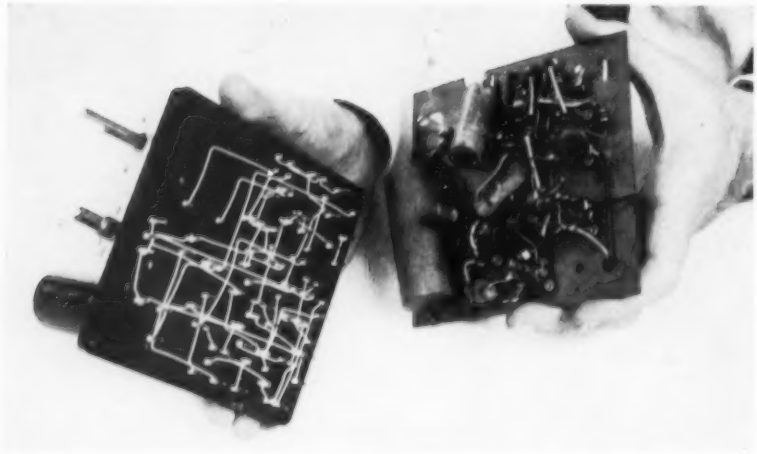

**Besides automatic assembly . . .**
finished parts are automatically ejected from the torus machine, washed, and balanced. Three balancers are automatically loaded, locate unbalance, and transfer assemblies to a welding station for weight correction. Here, a coil of steel is automatically cut to length and welded in the proper place



**Multiple-spindle drilling . . .**
produces rivet holes in the torus assembly after the shell, hub, carrier, and spacer have been installed on the work pallet. Holes can be produced in various patterns, are probed and deburred before riveting



**Punched tape . . .** speeds automatic assembly of solderless wrapped wire connections in complex electrical apparatus. Taped instructions in this Bell Telephone Laboratories experimental machine operate relays that translate the instructions into electrical signals for controlling mechanical elements. Two rotating spindles are used, with wire fed from a supply spool. One spindle pulls the wire to a terminal on a part that is to be connected and at the same time cuts it to the correct length at the second spindle. After removing insulation from each end of the wire as the bare ends whip around the terminals, spindles pick up the supply wire and move to the next connection where the process is repeated



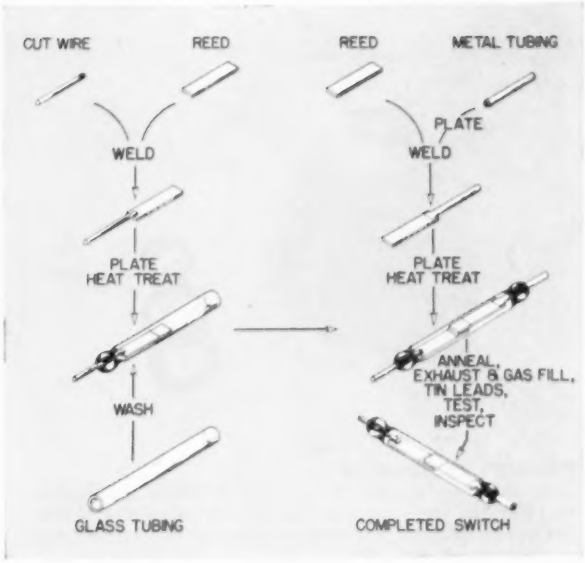
**Improved connections . . .** by automatically assembling wire is demonstrated here by two 5-tube radio receivers. Ordinary methods were employed for wiring the one at the right—solderless, wrapped wire connections were made automatically on the left-hand receiver. The experimental punched-tape-controlled machine can be applied for wiring other plastic panels on which are mounted electronic tubes, transistors, resistors, capacitors, or others with suitable terminals

## It's Expensive . . . But

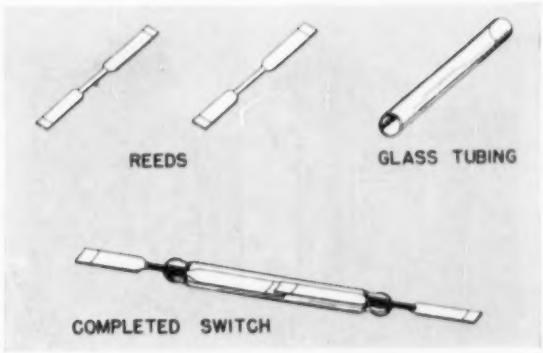
Obviously, a machine like this is expensive. But, in considering the pros and cons of automation, much more than the price of a machine is taken into account. First, production volume must be considered. In most cases, high volume is a prime requisite to justify the cost of automatic-assembly equipment. Stability of product design is equally important. Without a reasonable degree of design stability in a production run, it is difficult to develop practical and economical automatic assembly. However, careful analysis by the product manufacturer and good design on the part of the machine builder go a long way toward solving this problem. Machines can be designed with sufficient flexibility to permit changing of assembling heads when product components are redesigned. Unit construction, employed by several experienced builders, is helpful in this respect too. Care must be taken, however, to avoid designing too many adjustable and interchangeable devices into an assembly machine to accommodate variations in product design for the sake of flexibility. Such devices frequently add to complexity and become sources of mechanical trouble.

Another means by which flexibility can be obtained—and costs reduced—is by using commercially available basic units. Completely cataloged lines of standard rotary and in-line transfer machines are available that permit selection of machines to meet individual requirements. One line (Ferguson), for example, includes a selection of such equipment as well as a standard "packaged" power assembly for use in special machines. This package includes the Ferguson drive for high-speed

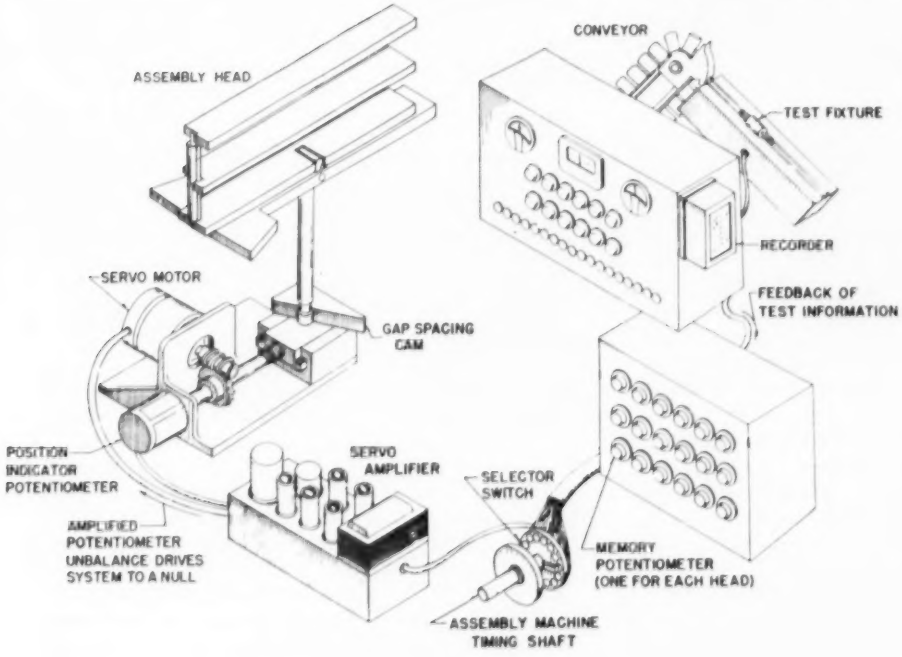
## OLD METHOD




## NEW METHOD

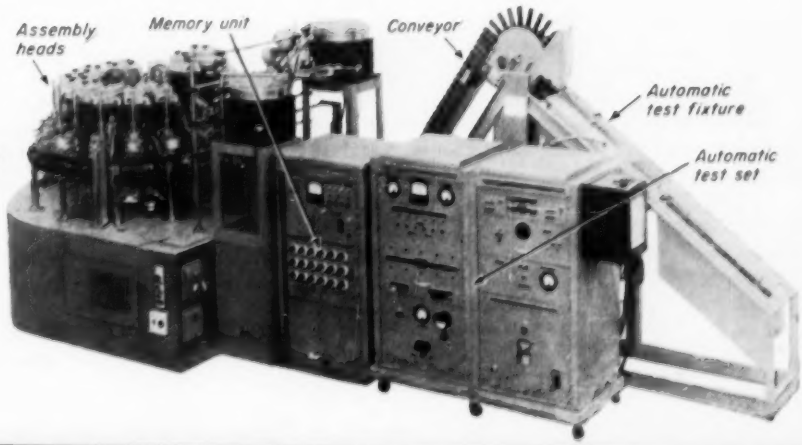


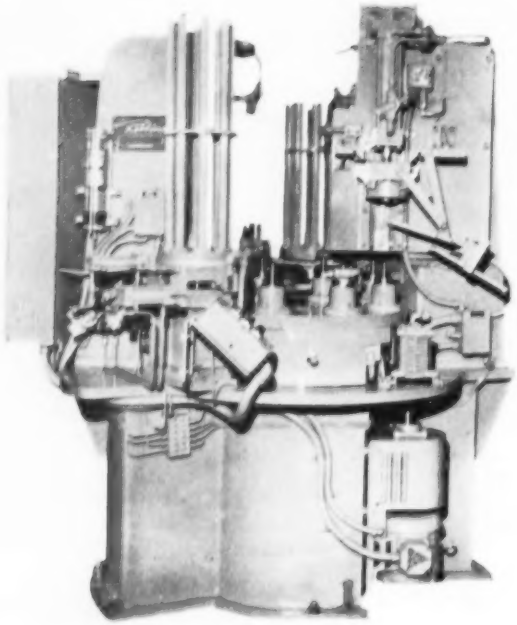

**Product improvement . . .**
and process economy is achieved by automatic assembly of reed switches used in telephone circuits. About 23 major operations were performed on 5 components of the old switch, left. Automatic assembly does the job in one, on only three components (right), at 1/20 former cost. Life is measured in hundreds of millions of operations without repair

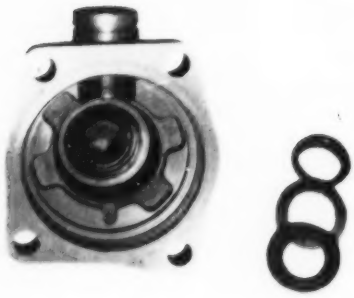



**100% inspection is combined . . .**
with automatic assembly of reed switches. Assembly heads are designed to set the critical reed gap by moving the lower reed away from the upper. Reeds are held vertically inside the glass tube by means of upper and lower chucks while the tube is held at the center. Spacing is accomplished by a memory circuit that constantly corrects the machine as necessary. In continuously rotating, the lower end of the gap spacing arm on each head passes over a fixed cam, thus moving it about 1/2 in. This moves the slide holding the lower reed chuck about 0.010 in. to adjust spacing

**A development . . .**
of Western Electric engineers is this automatic reedswitch assembly and testing equipment. Conveyor buckets pick up switches from individual heads so switches and heads are identified in automatic testing that follows assembly







**Precision construction . . .**
and rigidity are essential in assembly equipment. Stations in this Robbins rotary-indexing machine for assembling needle bearings in pump-end covers were jig-bored within close tolerances. Although work like this adds to the initial cost, considerable time and expense is saved in operation. Because of unit construction, new stations can be added or old ones improved when product design changes occur or new assembly methods are developed

indexing a gearmotor, clutch-brake, switches, cams and other components mounted on a base plate ready for installation.

In these standard machines, work-holding carriers are supported on anti-friction bearings as well as conventional supports—independently of the transfer force. A roller chain moving over three idle and one driving sprocket supplies this force and moves work intermittently from station to station. Tooling, of course, is developed by the user.

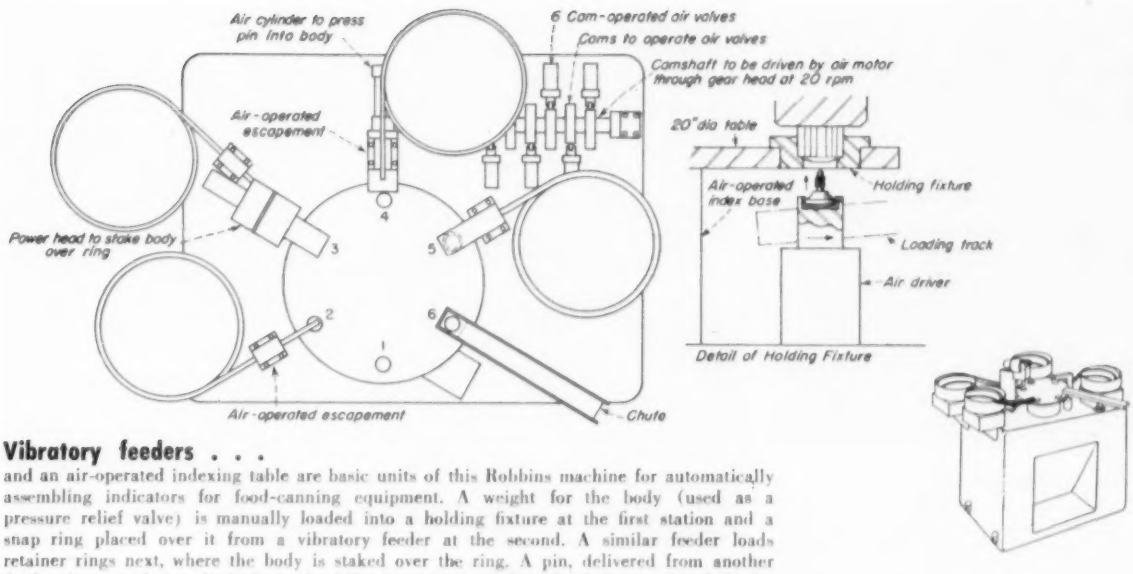
In a typical application of standard equipment built by Swanson Tool & Machine Products, Inc, special fixtures are mounted on 62 carriers for riveting, screwdriving, and other assembly operations on a water pump for an automatic washer. Commercially available units such as these are especially useful when frequent product-design changes occur and retooling is necessary. Other standard units commonly employed in assembly machines include feeders, selectors, hoppers, distributors and other commercially available devices, and, as is the case with standard machines, they can cut engineering and construction costs considerably where they can be applied. Small and medium-size plants with small engineering staffs (and large plants too) make excellent use of standard equipment for automating assembly operations.

The peculiarities of some products do not lend themselves to practical applications of fully automatic assembly. In many cases substantial production gains and cost reductions can be made by using one or two operators in place of complicated and expensive mechanical devices on a machine. Such semi-automatic assembly machines are built at a much lower cost than is required for fully automatic equipment—and are widely used.

## *Design for Assembly*

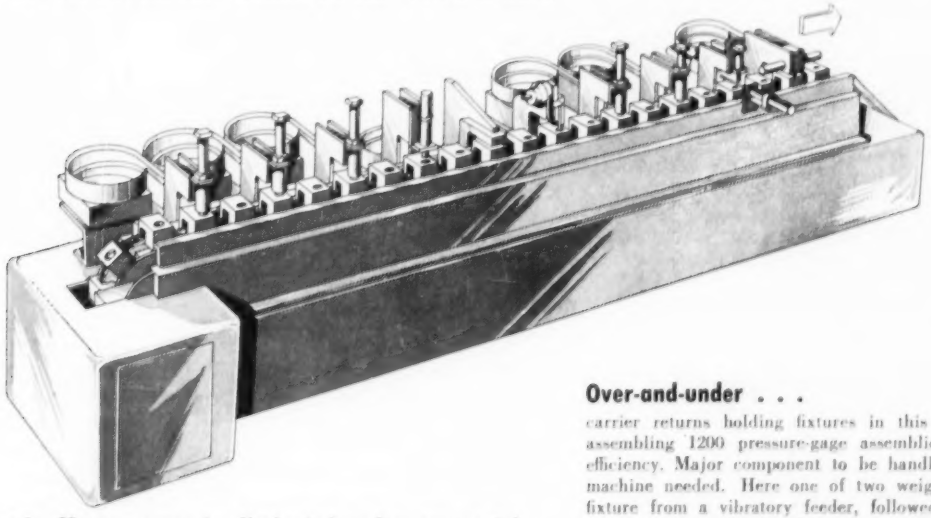
Product design must take into account assembly as well as processing operations. Considerable difficulty is encountered by the user who automates the assembly of a product made up of numerous components of old design. These should be analyzed and brought up to date as much as possible before developing automatic assembly. In this way, machine changes in the future will be fewer, and those that might be made are far less costly. Best way, of course, is to start out with completely new product designs rather than automatic old ones. In this way, the products can be designed at the start for automatic assembly. Proper handling of the components can be considered, and orientation is easier when shoulders, bosses or other working surfaces are available.

Complexity of a product and the number of components involved can make automatic assembly uneconomical or even impractical unless there are other more favorable factors involved as well. Chief among these factors are such advantages as uniformity of product. Components are automatically inspected, selected, assembled, and the same correct torque and pressure applied to each one at every


Air cylinder to press pin into body
6 Cam-operated air valves
Cams to operate air valves
Camshaft to be driven by air motor through gear head at 20 rpm
Air-operated escapement
20" dia table
Air-operated index base
Holding fixture
Power head to stake body over ring
Loading track
Air driver
Detail of Holding Fixture
Air-operated escapement
Chute

**Vibratory feeders . . .**

and an air-operated indexing table are basic units of this Robbins machine for automatically assembling indicators for food-canning equipment. A weight for the body (used as a pressure relief valve) is manually loaded into a holding fixture at the first station and a snap ring placed over it from a vibratory feeder at the second. A similar feeder loads retainer rings next, where the body is staked over the ring. A pin, delivered from another feeder, is pressed into the body at the following station, while a knob from a fourth feeder is assembled at the fifth. Automatic ejection occurs at station six. Total cycle time is 3 sec—with 1200 assemblies produced per hour at 100% efficiency.



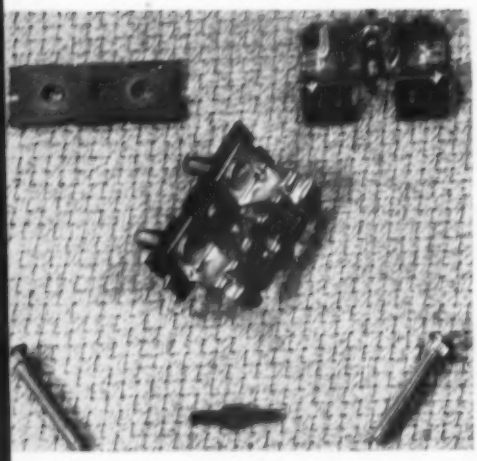
**Over-and-under . . .**

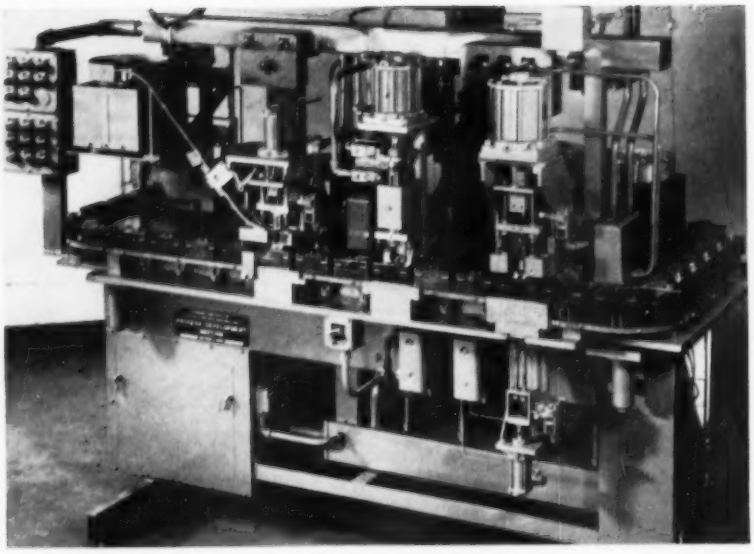
carrier returns holding fixtures in this Robbins machine for assembling 1200 pressure-gage assemblies per hour at 100% efficiency. Major component to be handled determines type of machine needed. Here one of two weights is loaded into the fixture from a vibratory feeder, followed by the second from another hopper. In the third station, the gage body is loaded in a similar manner; in the fourth, the body is counterbored. At station five, a valve stem is loaded in position and staked, as is a retainer ring in station six. A snap ring and a valve-stem cap are loaded and secured in the next two stations, after which two holes are drilled in the cap. Final operation is loading and crimping a wire handle

cycle. Human error is eliminated and every part is assembled in the same way. Quality is improved, too, and, of course, production rates are higher.

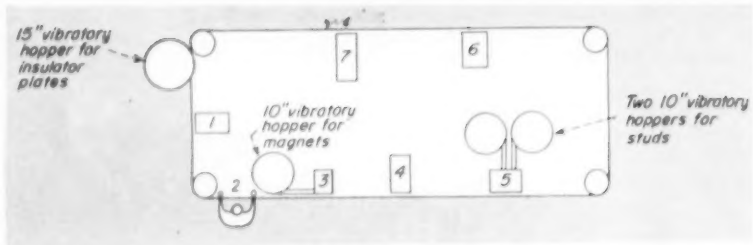
Another big gain is conservation of manpower. Production of each operator is increased in value through more efficient use of his abilities. Inspection and other operations replace duties eliminated by automatic assembly. This has the double advantage of insuring quality and at the same time making good use of manpower that might ordinarily be wasted in tightening screws or setting nuts.

With these advantages to balance against less-favorable factors, it is evident that automatic assembly can be economically sound. In fact, it may be uneconomical not to use it in many cases.





**Five components . . .** make up an ammeter frame produced by AC Spark Plug Div of General Motors Corp in an automatic assembly-machine built by the Process Development Staff. Frame, upper right, is manually loaded, while the insulator plate, upper left, magnet, lower center, and studs are delivered automatically from vibratory-feeder hoppers




**Chain conveyor . . .** intermittently indexes ammeter-frame carriers a distance of 5 in. in one second to seven stations in this assembly machine. One operator loads frames, at station two, after insulator plates are automatically fed to carriers. Magnets are installed at the third station, crimped in the fourth. Studs go in at station five, and station six pierces two holes in the assembly prior to ejection at seven

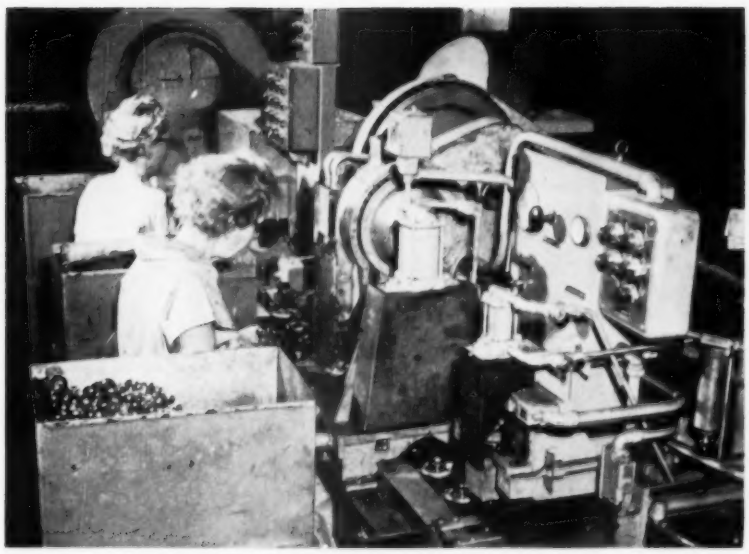
# *Build or Buy?*

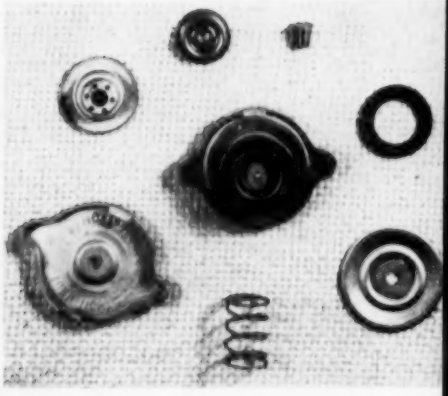
The development of an automatic-assembly machine may take anywhere from six months to a year or more—another good reason for being sure of product design before starting. This fact, and the inherent complexity of the equipment, limits the extent to which a manufacturer can employ automatic assembly.

Large firms might be able to set up a budget for an internal group of specialists to concentrate on such development work, but medium-size and small companies often have to buy this service from outside specialists. There is a distinct advantage with the latter procedure in the availability of expert attention to a problem, without overhead costs when the job is done. Moreover, the advantage of a backlog of considerable experience is gained.

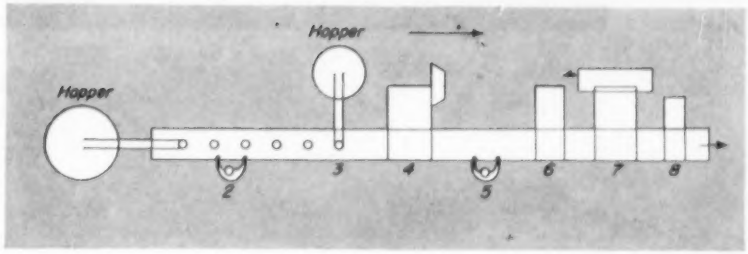
Some companies design their own machines and have outside contractors build them. Here there is the danger of divided responsibility unless complete understanding exists among all concerned. Reputable builders of special machines who take on the whole project under contract, on the other hand, accept full responsibility for performance.

One advantage gained by handling the whole job within a company, of course, is the more intimate familiarity with the product, production problems, and other influencing factors. One outstanding group of this type is the Process Development Staff at General Motors Corporation's Technical Center. Close cooperation exists between this group and other GM divisions, with the result that machines of a highly specialized nature are developed at the Tech Center for use in a variety of applications elsewhere. Production setup men, operators, and others from other divisions, for example, work at the Center with PDS men when a machine is ready for trial runs. They learn how it works, what it does, and why. During the conception and development stages, on the other hand, PDS personel visit the





**Functional testing . . .** is included in assembly of automotive-radiator pressure-sealing caps of all types. AC Spark Plug Div assembles them in varying pressure capacities ranging from 4 to 14 psi on PDS assembly machines. Previously, caps were checked with water pressure; now extremely sensitive air-circuit gaging, together with a mechanical weight system, eliminates liquid testing




**Springs are hard to handle . . .** automatically, so they are loaded manually in this radiator-cap assembly machine. At the first station, caps are fed from a hopper to carriers on an over-and-under chain conveyor. Next the washer and spring are manually positioned, followed by automatic loading of the main valve. These components are riveted and staked at the fourth station, then a vacuum valve is added, manually. At station six, this valve is pressed into the main valve, and the whole assembly is tested at the seventh. Eighth station automatically rejects out-of-limit assemblies

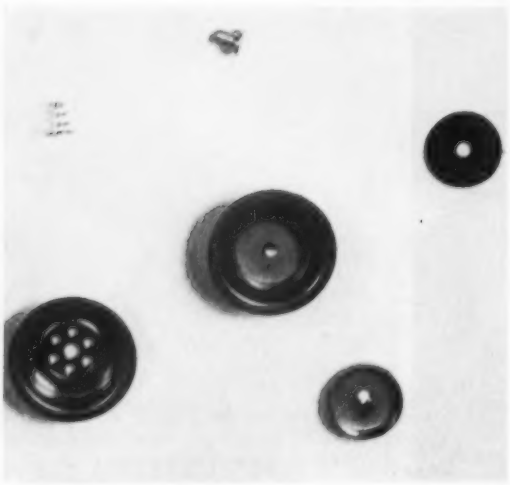
division concerned and learn its particular needs first hand. This is ideal for assuring proper initial operation and a minimum of difficulty in satisfying a user's needs. Of course, GM divisions also buy the greatest percentage of this type of equipment from outside builders.

In any case, problems in operating automatic-assembly machines are usually somewhat more complex than those in other automatic machines. With the latter, the transition is from a form of automatic processing where tools, individual machines and the like, are "automated" or evolved into a single machine. As a result there is a backlog of experience that helps when trouble occurs. With automatic assembly, operations replaced are largely manual, transition is greater and the user has no comparable experience on which to draw. Applications are still so new that opinions vary as to whether or not bolts can be run without first starting them, whether screws are better than bolts, and similar questions. In some instances, automatic operations are assisted manually (especially in orienting difficult parts), in others manual inspection is included; but in all cases, operations are as automatic as possible.

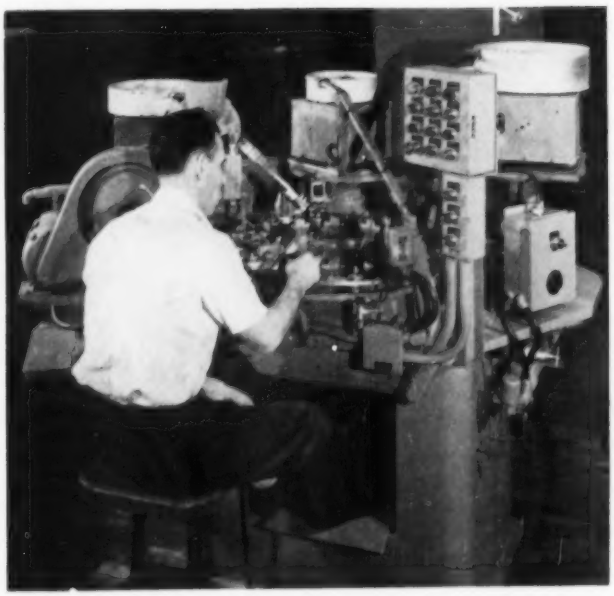
## *Basic Design Problems*

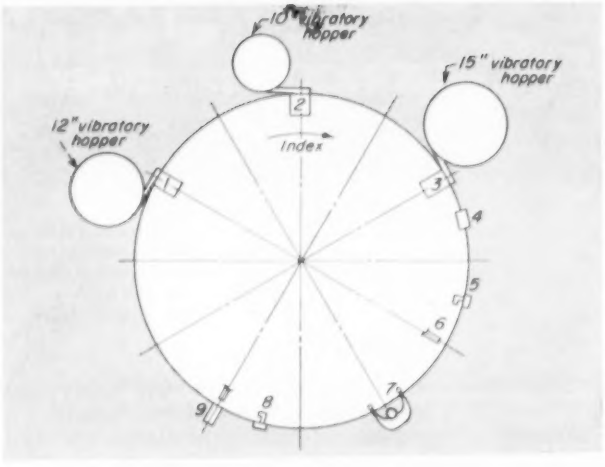
Automatic assembly machines, perhaps more than any other kind of equipment, must be rigid, relatively maintenance free, and capable of long, continuous operation. They may be of several types: dial indexing, indexing rectilinear, in-line transfer, or single station. Assembly heads or mechanisms are mounted on the basic machine and interlocked mechanically or electrically to form a composite whole that automatically operates in a predetermined sequence.

Basic design requirements include a high degree of accuracy—operations must be held at least as



**A spring is the problem . . .**
in this vacuum valve, too. Other components are a gasket protector, the gasket, a retainer and a rivet. A 28-in. rotary-indexing table with a Warner clutch and brake and a Ferguson roller gear-index unit are the basic parts of this PDS machine used to assemble the valves at AC Spark Plug. One operator handles loading of springs, to eliminate entangling






**Carriers Index 30° in 0.375 sec . . .**
on the PDS vacuum valve assembly machine. A pin in the carrier strips parts from feed tracks, positions them, and depresses at the riveting station to form the rivet. Gasket protector is loaded first, then the gasket and retainer, (stations one, two and three). The retainer is rolled down at four, and station five checks for missing parts. Incomplete assemblies are blown off at six. Springs are added manually at the seventh, followed by a check for empty carriers at eight. Ninth station is the last, where the rivet is automatically installed and the finished valve blown out of the carrier

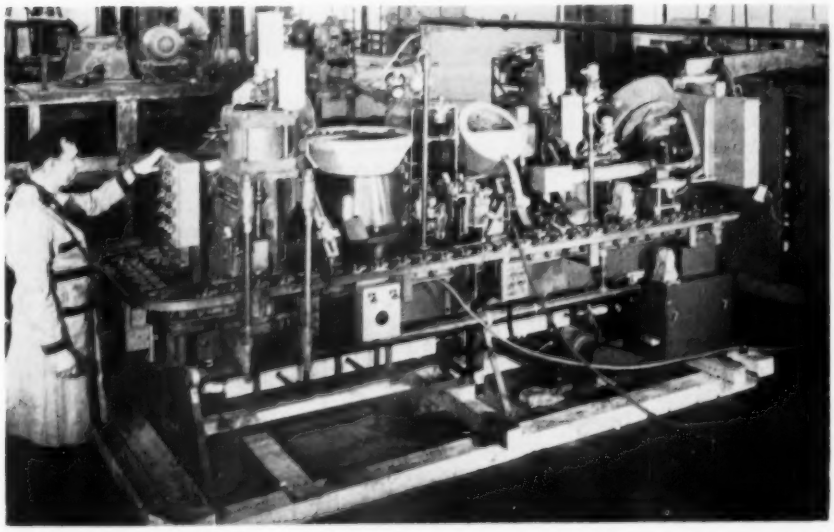
close as those used in producing the part. The machines must accept and assemble machined parts that are correctly sized. For example, a crankshaft made to the low limit of a dimension should not be assembled with a bearing made to the high limit. Same with a piston on the high limit and a cylinder made to the low limit. Inspection and selection make up the backbone of an assembly machine. In-process gaging (automatic sorting and rejection) eliminates scrap problems that might otherwise take all the advantages out of automatic assembly. Where sorting and gaging might become excessively expensive, consideration is given the combining of assembly with machining—as in the case of press-fitted parts. Here control over at least one variable—the hole size—can be maintained.

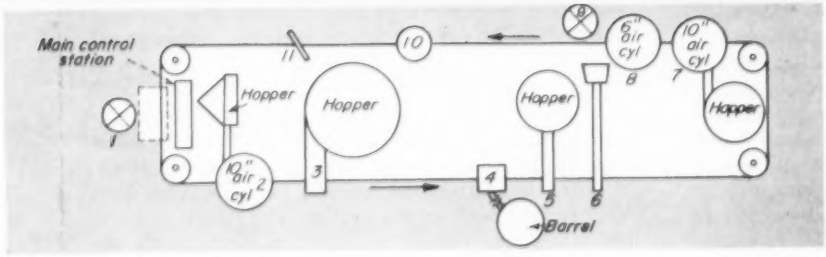
Experience has shown that allowance must be made for out-of-limit parts. The machine designer cannot believe part prints. If one or two pieces enter a machine where no allowance has been made for parts outside of print dimensions, a jam is almost certain to occur. Such allowances are especially necessary in cases where stampings are handled. Consistency of the parts involved in a particular assembly or subassembly is extremely important. Automatic feeding, metering, transferring, orienting and the actual assembly operation, in most cases, require uniformity in parts for successful operation of mechanisms employed. Even though close tolerances on matching faces or holes are not required for product purposes, they are often necessary for successful automatic assembly.

One big problem is handling a number, or a multitude, of parts as compared with the one part usually processed through stations of more conventional automated equipment. Each part must be handled individually and positively—placed exactly where it belongs in the machine by mechanical or other means—and located surely and accurately in the assembly. Feeding a wide variety of components of different shapes and sizes contributes to the problem, especially when they must be oriented. Parts that nest within each other or become entangled present special problems as do those that are not symmetrical or have unusual shapes or have no working or locating surfaces. Often a basic hopper requires considerable "cutting and trying" on the floor before it will work properly. It is not always possible to employ conventional hoppers, feeders, chutes, and other devices—or if they can be used, there may be a variety of them in addition to specially designed feed units. This is true, too, of the working or assembly heads. Usually, these are not standard units as are the drilling, reaming, tapping, milling, welding or other heads employed in more conventional machines. As a result, designers start from scratch, without preconceived notions. Of course, for the sake of economy, commercially available parts and equipment are used wherever possible.

In the design of a majority of automatic-assembly machines, unknown factors are difficult to predetermine. One of these is how successfully some parts involved in the assembly can be automatically fed and loaded, and at what speed. Automatic equipment with multiple functions can only produce at a net production rate consistent with the slowest operational cycle involved in the entire process.

Standard indexing or transfer-machine chassis provided with infinite index cycle and speeds often simplify these design problems. Because standard chassis units are available on relatively short delivery, a designer can delay requisitioning them until he has completed experimental tooling tests to determine and prove proper functions and operating speeds. In cases where all operational devices in a given project are known, standard chassis units can





**Assembly costs are cut . . .** in making tie-rod sockets at Chevrolet-Buffalo Div, GMC. Here seven parts are put together; the blank tie-rod socket, a bearing seat, a ball stud, a spring-retainer washer, the spring, top cover, and a rubber grommet. Linear-indexing assembly machine built by PDS employs mechanical indexing mechanism with a ratchet and pawl and single-revolution clutches. Stations are adjustable to allow for chain stretch, and air power is used for all pressing operations

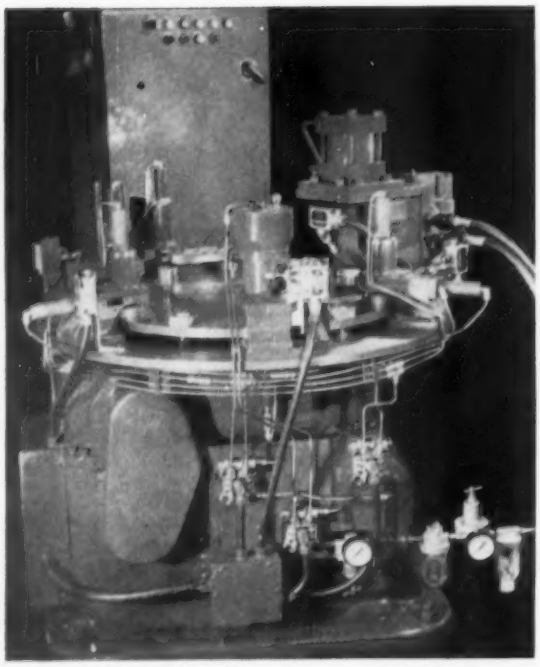
**First operation is manual . . .** in assembling tie-rod sockets—then bearing seats are automatically loaded, as are ball studs. Grease is applied automatically at the fourth station, and a spring-retainer washer added at five. Next station (unlike many other machines) installs springs automatically. The top cover is added at seven, crimped in place at eight. Completed assembly is manually turned over in the carrier at the ninth station and the rubber grommet put in place. The grommet is pressed in position at ten and finished assembly automatically unloaded at eleven. Small main control panel is conveniently mounted directly on the machine

be obtained for the job with flexible work cycles that can be adjusted to suit needs of the tooling.

While the various types and models of standard chassis units provide cost and time saving, full consideration must also be given to the particular requirements of a given job. In selecting the proper type of standard indexing machine chassis, such factors as total weight load, speed of index, accuracy of work positions, number of work stations, time of work cycles, and maximum work thrusts at the work station must all be considered. By the use of these chassis units, many automatic-assembly machine projects can be economically justified, and by providing a design starting point, the designer of a proposed machine only need determine the function and cost of the fixtures and devices required.

Typical of the numerous considerations to be taken into account is the question of studs versus cap screws. To reduce assembly problems, studs are avoided, where possible, in favor of cap screws—no nut running is necessary and they are generally easier to handle. Where studs are needed, as in assemblies where a part must be held in position while other fasteners are employed, they can be used sparingly.

One means of avoiding mechanical trouble is to use numerous stations rather than crowding several operations into a few. Accessibility for maintenance is important too, and there must be plenty of space to allow for modifications resulting from product design changes. In many cases, backup stations, auxiliary equipment, and other means are provided to allow for possible downtime and to avoid disrupting production.



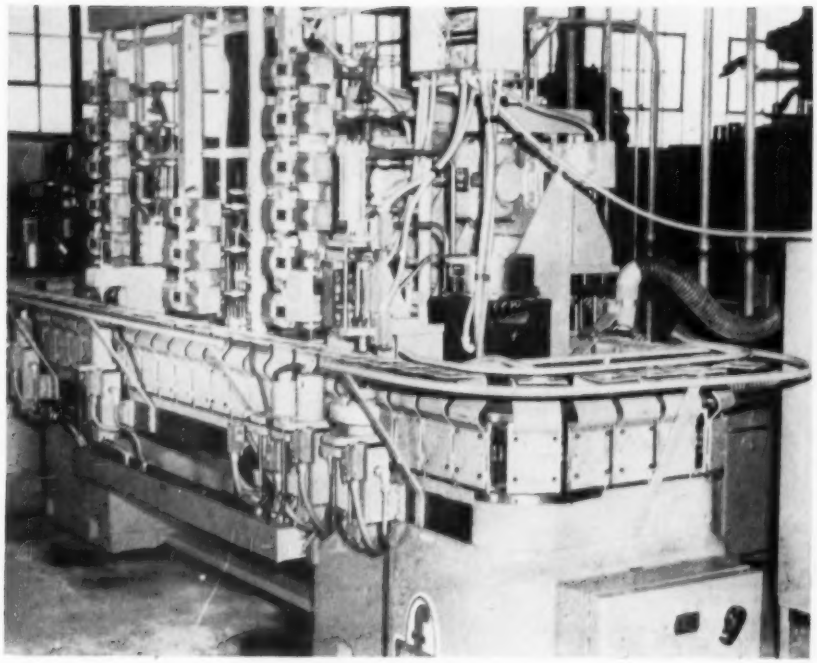
**Roller-skate wheels . . .**
are assembled automatically in this standard Ferguson rotary transfer machine. Setup includes a standard index table, stand, power assembly, and control panel. Dial is 36 in. in dia, has 12 stops, a 270° indexing period, and seven work stations. Such commercially available components are frequently designed into special assembly machines, and in many cases—as in this one—they make up an automatic assembly machine, require only the necessary tooling

## CASE STUDY:
# *Cylinder head assembly*

Equipment that makes considerable use of backup devices was developed by General Motors' Process Development Staff for Oldsmobile Division. This is a straight-line indexing machine 137 ft long, designed to assemble 400 cylinder heads per hour by indexing every nine seconds. Index time is two seconds for a 23.48-in. travel, leaving seven seconds work time. Of 68 stations, 18 are automatic, two are semi-automatic, 22 provide manual backup for the automatic stations, 15 provide access for maintenance, there is one load station, one idle station over the head sprocket, four for spring-assembly units, and five stations are included for future product design changes. In addition, space is provided for complete manual assembly of cylinder heads, if necessary.

A number of design innovations have been incorporated. Among them is a unique transfer mechanism that employs a Chevrolet truck clutch, for long maintenance-free life and inexpensive changes. A 20-hp motor runs continuously to drive a gear-reducing mechanism that is engaged and disengaged with a crank arm on the output side. This is accomplished by the truck clutch and a brake clutch between motor and reducer. By locating the crank arm, which transfers the work, in approximately zero position at the start of the stroke—and moving it through 180° to the end—a harmonic motion is obtained to provide uniform acceleration and deceleration, together with high starting and stopping forces. The driving clutch, of course, is disengaged when the braking clutch is engaged.

An over-and-under chain conveyor driven by this mechanism carries work pallets over two large-dia sprockets, (one at each end of the machine) to index them from one station to another and return them. A crank arm drives the transfer bar which has dogs that engage lugs on the pallets. The chain connects the pallets to permit their return underneath the machine with forward movement of the transfer bar. These pallets are "floated" in the carrier to permit accurate self-alignment at each station with shot pins. Indexing accuracy, however, is controlled positively by the transfer mechanism.



**Distributor caps . . .** are machined and assembled in another standard Ferguson in-line machine. With the base made up of three sections, (two end castings and a channel iron midsection), such machines can be varied in length by increasing or decreasing the midsection. In one case, a machine 30 feet long was developed by this means and greater width was obtained by bolting two sets of standard end castings together. The roller gear drive employs a cam indexing mechanism with an initial force of zero, a sinusoidal increase, and a smooth deceleration back to zero

Forerunner of this machine is the mechanized cylinder-head-assembly equipment at the Plymouth Engine Plant in Detroit (*AM*—Aug 15 '55). Two of these machines and one for assembling engines were built by The Cross Co, and make use of manual assistance in positioning studs, valves, spark plugs, and other components before they are automatically fastened in place. As the result of experience gained in developing this equipment, improvments in later Cross machines have been considerable. Moreover, costs have been reduced drastically.

As the result of designing flexibility into the equipment (lines are made up of individual units that can be removed, replaced, or changed around), Plymouth can make changes and take advantage of new developments. Automatic stations can easily be added to replace those originally semi-automatic or manual.

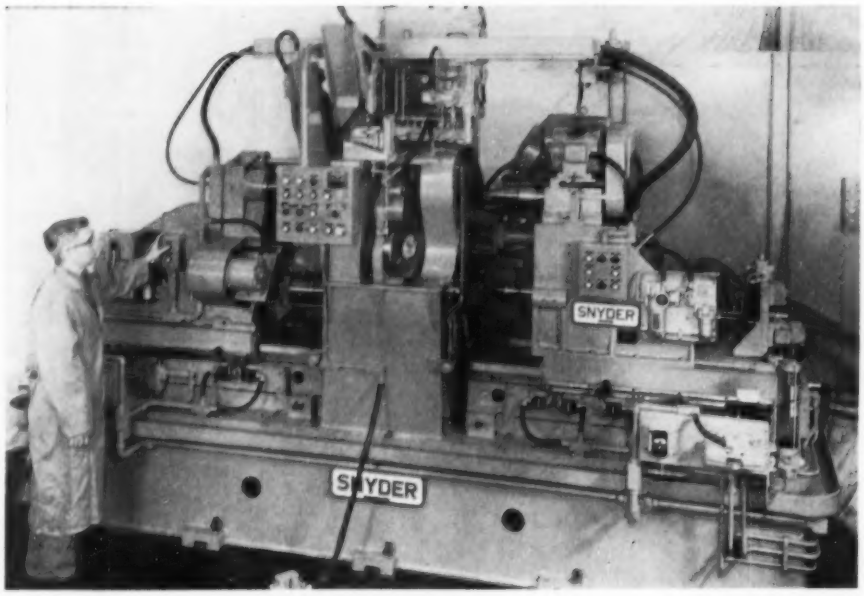
## CASE STUDY:
# *Turbine assembly*

One of the largest assemblies currently handled automatically is the main turbine, or torus unit, the Hydromatic transmission used in most 1956 GM cars. Made up of a 12-in.-dia shell, a hub, vane carrier, spacer, and 36 vanes, these assemblies comprise both driving and driven members of the torus unit. Built by GM's Process Development Staff, for, and in cooperation with, Detroit Transmission Div. a hydraulically operated electrically controlled machine for this work is about 70 ft long and 18 ft wide, including all auxiliary equipment. This represents considerable space saving compared with manual assembly.

The most significant development in this machine is the means by which stamped vanes are handled. In the first place, the 36 vanes required in each main shell present an assembly problem because they are not uniformly spaced. (Irregular spacing of vanes breaks up resonant harmonies in the operation of the turbine.) It is necessary to locate them individually from slots into which they are loaded from cartridges rather than registering from each other as they go in. As is common when working with stampings, it was also necessary to anticipate problems caused by bent or otherwise damaged vanes, or stamped shells that might come through out of limits. To handle this end of the job, vanes are semi-automatically loaded into cartridges at the stamping press on a 9-sec cycle, then automatically conveyed to four automatic loading machines separate from, but adjacent to, the main assembly machine. At loading machines, a shot bolt enters slots in the shell being loaded with vanes and registers the location—being removed automatically just before a vane enters. Indexing here is on a 25-sec cycle to completely install 36 vanes in each shell.

The main assembly machine employs floating pallets on which the shells with pre-assembled vanes are automatically loaded. Pallets transferred by means of two transfer bars in a rectangular path are located within 0.001 to 0.002-in. accuracy by shot

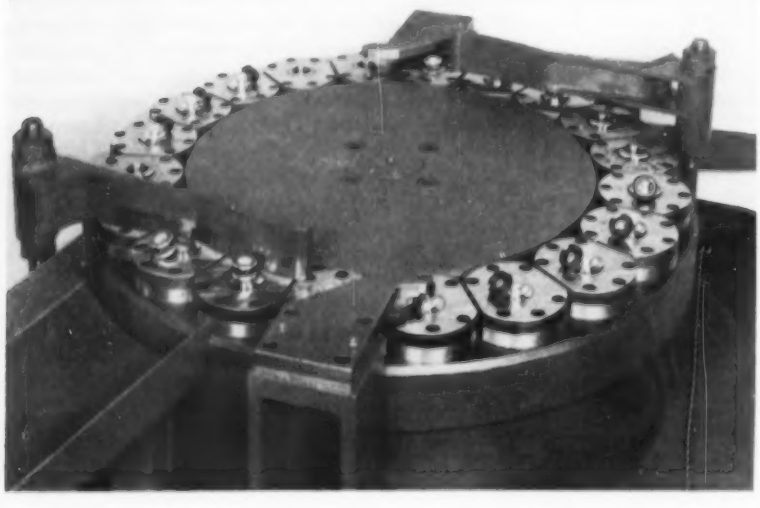
**Machining and assembly . . .** are combined in this double-end, 6-station vertical-trunnion, Snyder machine. Die-cast electric-motor end shields are manually loaded at the first station, then indexed to the second where the outer hub is rough bored, faced, grooved, and chamfered and the inner hub faced. The hub is finish bored at the third station, where the OD of the shield is turned and a rabbet turned and faced. A babbitt bushing is installed at station four by means of a hydraulic backup plunger — brought up to within 0.002 in. of the back face of the hub. Both hubs are faced in the fifth station, and one face of the bushing chamfered in the sixth




bolts at each station. Each index is made as close as possible, leaving clearance for the shot bolt to pull the pallet into alignment. Inasmuch as the part is not heavy (compared with a cylinder head or an engine block) deceleration is provided for. Two dogs on each transfer bar individually push and retain a pallet. Cycle time is based on an 18-in. index in two seconds, plus a 7-sec work period.

### Flexibility Built In

Flexibility is essential (and is provided) because four or five different parts are run in the machine with only minor tooling changes. For example, the number of rivets needed for assembly varies, as does their pattern or location. To permit use of common components, (shell, hub, carrier and spacer) rivet holes for these parts are drilled after locating them on the pallet. A multiple-spindle drillhead allows the drilling of 11 holes to set up any desired pattern, although only nine holes are used. Likewise with the rivet feed. There are 11 tracks from this hopper, and the escapement permits feeding any desired pattern. Besides gaining flexibility, later balancing of the torus is simplified, because the components can be more accurately centralized relative to each other at the drilling op-



**Manual assembly . . .** of rubber sealing cups on brake-cylinder pistons was uneconomical and unsatisfactory, resulting in the development of this Snyder machine. Two operators work on each side of the dual machine to install 3600 assemblies per hour. Each places a piston in a collet and lays a rubber cup against the piston as shown. The collets travel under spindles that snap the cups on the brake pistons. Following this, the assemblies are released, ejected, and wiped off into feed chutes as the collets continue traveling

eration. A feature of the riveting station is an air-gaging circuit that controls the press ram for a final squeeze position. This controls the shape of the headed section to specific height and dia tolerances.

Considerable attention is also given chip removal from the drilling station prior to riveting. The mechanism provided insures a tight assembly and eliminates the danger of trapping chips in the unit.

Another unique operation is spinning the vane tabs over to anchor them in place. Here, rollers are fed into the work—retracting when the job is done. After crimping the shell at the next station, every other vane is dimpled with punches and dies—18 at a time. Numerous other unique operations are performed by this machine, among them the electronic gaging of five dimensions. These are: shell OD runout, shell face runout, overall height of the assembly, height of the vanes in relation to the shell edge, and the dimension from hub to shell edge. This required rotating the assemblies and, in the event an assembly is outside allowable tolerances, a memory circuit is excited to segregate the part at the ejection station.

Automatic washing and automatic balancing (AM—Mar 26 '56) follows. Automatic assembly in this case has not only been economicaly justified, but quality is greatly improved by 100% inspection at a minimum cost.

## CASE STUDY: *Punched-tape assembly*

One of the big fields for automatic assembly is the electronics industry, where complex electrical apapparatus are built and used in large quantities. Among developments in this area are automatic machines that align and assemble, and in some cases connect such devices as capacitors, transistors, resistors, electronic tubes, and other electronic parts to suitable terminals. Bell Telephone Laboratories in doing product design work on a wire spring relay (*AM*—Aug 27 '56, p105) had to consider design features that would lend themselves to the anticipated method of manufacture. From this was developed an experimental machine, the punched-tape control principle of which, used with wire-wrapped connections, might be applied to automatic wiring. Clevite Research Center of the Clevite Brush Development Co is now working on similar equipment controlled by paper tape under Western Electric licensing of the experimental Bell patents. In preparing the tape on a coding service, a product designer assumes full responsibility for the circuit whether it is to be made once or by the hundreds. The tape can be maintained as part of a library—thereby eliminating the need for large inventories. Changes or modifications are simply a matter of transferring all coded information that remains the same from one tape to another. Only those rows of holes are changed which represent a modification in the circuit.

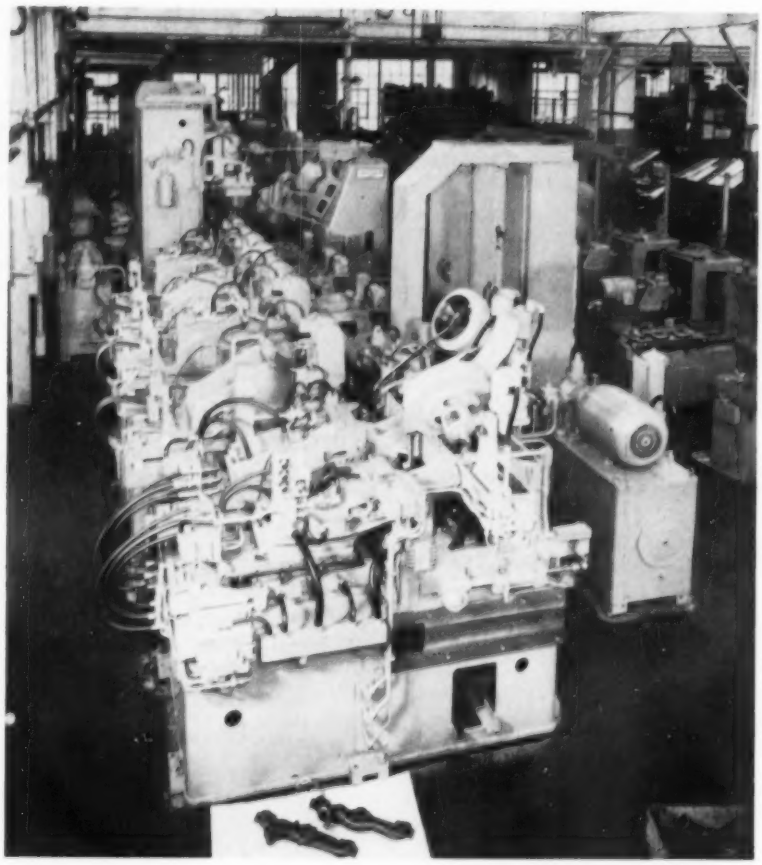
### Quality Improved

The wrapped connection consists of five or six turns of wire around a terminal with one or more sharp edges. Tension applied to the wire produces compressive stresses near the edges so that the wire and terminal are deformed, forming a gas-tight contact area. Results of tests at Bell Telephone Laboratories show that such connections—made without solder—withstand severe conditions of humidity, corrosive atmosphere and heat. They also eliminate concentration of stresses in soldered joints at the point where the wire leaves the solder, thus decreasing the possibility of breakage from vibration of the assembly.

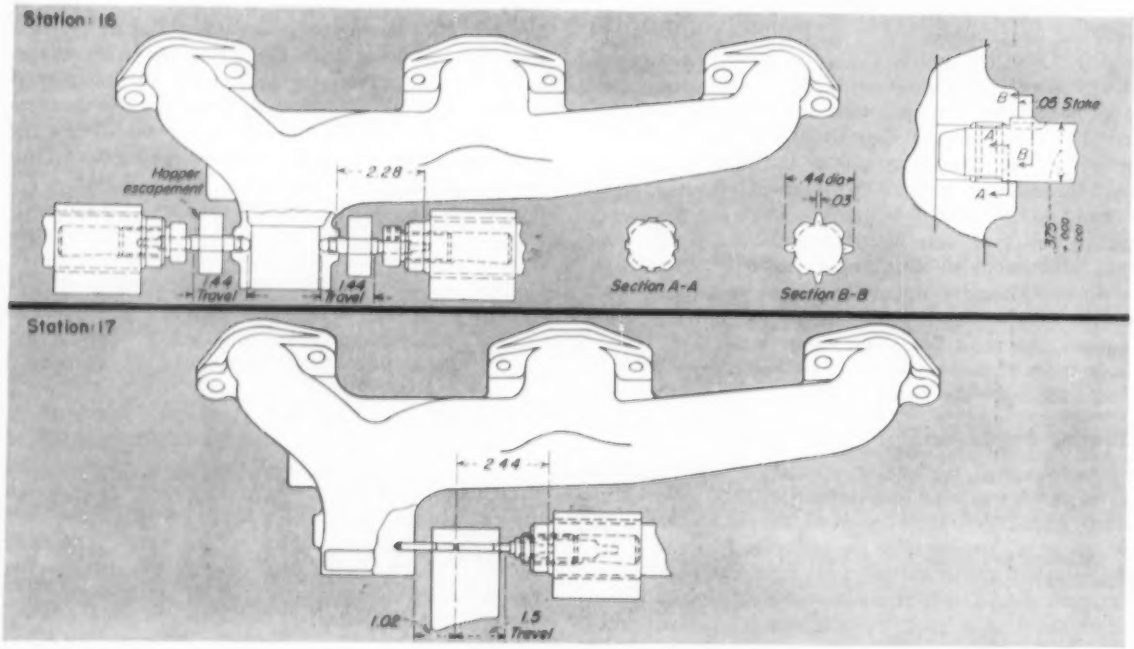
The machine employs a terminal board, (into which the components have previously been inserted) located in a rotating frame. The frame can be indexed to four positions, 90° apart, so wire connections can be made in four different directions, thus producing a neat and uniformly distributed pattern. Two air-driven spindles—one rotating clockwise, the other counterclockwise—are mounted on slides that move vertically and horizontally. This aligns the spindles with the terminals to be wired. Sequence of operations requires a 3-dimensional motion, X and Y directions for aligning the spindles with the terminals—and one in the transverse, or Z, direction, to insert the wire-wrapping tool onto the terminals.

The wire-wrapping tool grasps the wire fed to it from a supply reel and bends it into the proper position before wrapping it. It also strips the insulation when it starts to rotate in the wrapping process. An automatic spring and clutch-operated indexing system repeatedly stops rotation of the tool in the same angular position, so it can grasp the supply wire each time. Wire is fed from the spool in the correct amount by a one-turn clutch, and a small cutter shears it at the proper time. While the wire is fed and the connections are wrapped, the tape reader supplies new position and direction data to the code units.

Because of the flexibility of this equipment, it is particularly adaptable to short-run production. Investment and upkeep are relatively small and cost per connection is low.



**Two bushings and a pin . . .** are assembled in left and right exhaust manifolds in this 17-station Snyder in-line transfer machine. Both types of manifolds are processed through the machine simultaneously in pairs at a production rate of 160 per hour, each, at 80% efficiency. Loading is handled at the first station, followed by core drilling different size holes in each part and drilling and tapping. Other machining operations include spotfacing and reaming. At the sixteenth station, two bushings are pressed and staked in opposite sides of the parts, and at the last station a pin is pressed in place



## CASE STUDY: *Assembly and testing combined*

Another automatically assembled product of the electronic industry is the reed switch—a device that performs the same function as two-leaf spring contacts found in conventional relays. Made up of two identical nickel-iron alloy reeds (gold-plated at the contact ends for good contact characteristics) and a short piece of glass tubing, automatic assembly of these switches has reduced their cost to 1/20 the former value, making their use in telephone systems entirely practical. These three components are not only assembled automatically and the resulting switch filled with a gas, but also they are 100% inspected and corrected in process.

An assembly machine developed by Western Electric includes a clockwise rotating, horizontal table on which 18 assembly heads are mounted. Continuous rotation eliminates the vibration inherent in indexing which might adversely affect the critical accuracy of reed spacing.

Test equipment included operates in accordance with the machine cycle so only part-time manual attendance is required to fill the parts-supply line and correct any troubles.

The machine has three decks. An upper deck carries heads with chucks for the upper reed; one in the center holds the chucks for the glass tube, and the third is underneath and contains chucks for the second reed. Two upper decks are lifted vertically to permit picking up individual switch parts and to insert two reeds inside the glass tubing. A pivoted gap spacing arm causes the lower chucks to move in relation to the rest of the unit, thus providing a means for setting the reed gap. Reeds are oriented and fed into the assembly machine by two vibratory feed bowls at the same time glass tubing is fed from a magazine. Transfer heads deliver these parts to the expanded chucks in the machine heads. As the machine heads close, glass and reeds are telescoped together and current is applied to a platinum-alloy coil surrounding both ends of the tube. Sufficient heat is generated to cause the glass to soften and seal around the metal reeds.

When the upper seal is complete, the reeds are spaced apart by means of a gap-spacing cam—and the glass is sealed around the lower reed. During glass sealing, air in the switch is displaced by blowing a fill gas through the tube—thus eliminating welded-metal tubes previously required. After the assembled switch cools, the head opens and the assembly is discharged into a bucket conveyor. The conveyor is synchronized with the machine and has buckets related to each head. In this way, the identity of each switch is transferred to an automatic test fixture. Here, in addition to 100% check on operating, release, contact resistance, and voltage-breakdown characteristics, a test is made to determine if the operating value of the switch lies above or below a nominal specification—90 ampere-turns. The operating value is fed into a memory circuit in the control cabinet and stored in the corresponding one of 18 potentiometers. At the proper time, this information is fed back to a servo motor in the machine.

### Feed Back Controls Quality

This motor adjusts the sliding cam surface which moves the gap-setting arm on the assembly head to its most desirable position. The servo system functions by comparing the memory potentiometer setting with the position-indicator potentiometer on the sliding-cam mechanism. Voltage difference between the two potentiometers is amplified and fed to the reversible DC servomotor which then drives the system to a null and produces an exact cam setting as governed by the memory potentiometer.

When a switch under test has an operating value below a specified nominal, the reeds are too close together and a device in the control cabinet automatically adjusts the correct memory potentiometer upwards a small amount to increase reed spacing on the next switch assembled on that head. Also, if a switch has an operating value above nominal, its potentiometer is automatically adjusted downward to decrease reed spacing on the next switch assembly.

In this way, corrective test information is continuously fed back to the assembly machine through the memory circuit. The assembly machine includes this system to sense, interpret, and feed back data for every switch made. As machine adjustments are made automatically and continuously as required, all switches have operating characteristics centered about the nominal specification.

## CASE STUDY:

## *Needle bearings assembled*

In another somewhat simpler, but equally precise, application, an 8-station rotary indexing machine automatically installs a needle bearing, a washer, and a seal in an automotive steering-gear end cover. Parts are automatically fed and positioned from indexing magazines while the completed assembly is removed and placed on a conveyor. Production rate is over 700 assemblies per hour. Built by Omer E

Robbins Co, Detroit, this small machine is exceptionally rigid for such a relatively light operation. What might be considered conventional machine-tool construction gives high accuracy. Ways are hardened and ground and lubrication is automatic.

The index table employs both a barrel cam and a shot bolt to insure accuracy and is operated through a magnetic clutch and brake. Indexing time is one second, with a four-second dwell. Dwell time is controlled by a synchronous timer and electrical interlock at each station.

This apparently simple assembly job is somewhat complicated by the components themselves—as is frequently the case. For example, needle-bearing construction includes a soft retaining lip at one end of an otherwise-hardened steel cage. Obviously, pressing the bearing in place must always be performed against the opposite, hard, end. To accomplish this, magazines containing 60 bearings are manually loaded to insure proper orientation. Eight loaded magazines on the table provide an appreciable supply—and, of course, the feed direction is always correct.

When one magazine is empty, the machine automatically stops indexing. The operator then presses the re-cycle button so a full magazine is presented over the assembly station. While this one is being used, he loads another.

## Seals a Problem, Too

The bearing is the first component installed, followed by the washer—which presents no difficulties with orientation. This is installed in a counterbored seat over the bearing and is followed by the seal. Here, again, orientation is important. Ordinarily, a conventional hopper with a suitable selector or orienting device could have been used. However, its light weight and the need for 100% accuracy in orienting it to present the proper sealing face in the correct direction made it advisable to employ the technique used for the bearings. Therefore, seals are manually loaded on a rod and installed in magazines for automatic delivery at the assembly head.

All stations are interlocked to prevent installation of any other component if another fails, for some reason, to be assembled. This is handled by an electronic memory circuit operating through electrical contact pins. In such a case, the machine doesn't stop, but the operator can see that nothing at all has been installed in the cover.

In accordance with best practice, all parts are handled positively. Each component is picked up from the bottom of the magazine that feeds it by means of a shuttle slide. It is thus carried to the assembly station, where a vertical post with an angular face extends through the bore of the end cover in which it is to be assembled.

The shuttle moves the seal, washer, or bearing up the face of this post where it rests momentarily at an angle. In this position, the part contacts a limit switch above the post, thus indicating that a part is about to be installed. If the switch is not tripped in this manner, the next station is idled so no other part is installed.

A spring above the post then pushes the part down over the post. At the assembly station, a hollow, vertically reciprocating cylinder pushes it down the post to its seat in the end cover.

## Special Relays Save Space

Robbins Co designed its own control panel for this machine and developed a special circuit to permit use of small, low-amp, plug-in, aircraft relays that operate solenoid valves. About 1/3 the size of the usual machine-tool panel, this one is small enough to mount directly on the machine, thereby saving valuable floor space. Maintenance costs are reduced considerably, too, because two spares are provided for each of the 18 relays required.

## Acknowledgments

We wish to acknowledge with thanks the assistance and cooperation extended by the following companies and individuals in preparation of this report:

| | |
|---|---|
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# Vacation Rights

"You know; we ought to do something about vacations for the men who just start working here in the summer, Ed. I've got Jorgenson, my new mill operator, on my neck for a week off to go hunting. He's only been here a month, so according to the rules he's out of luck."

"That's tough, Al. He shouldn't have switched jobs in the summer. Does he expect the company to support him free for a week before it's even sure he's going to stick around?"

"Well, I'll tell you what he told me, Ed. He says they have a system in Sweden where each worker gets his regular vacation regardless of how long he's worked at a new plant. It's sort of a nation-wide vacation plan, with each company giving the same amount of vacation time to all employees."

"That's fine, Al; but what happens if the guy took a vacation where he worked last; then he tries to get another one out of us a month later?"

"That's easy, Ed—we just phone his last boss and find out."

"And get his last boss to stand part of the cost of his time off, too?"

"Well, no. I guess that wouldn't work. But it seems to me the company could stand just a few extra vacations for the fairly new men. They have to work here a full year before they're eligible, and I don't think that's quite fair."

"That's the way it's always been done, Al, and I doubt if you'll be able to change it. It's standard practice."

"Sure; that's the same answer the company has to every new idea—we always did it one way, so we have to keep doing it that way. What kind of an attitude is that?"

"Look, Al; if you changed the rules, you'd get a big gripe from all the old timers who *did* have to wait for a year before they got a vacation. It isn't fair to them."

"That's a lot of bull, Ed. I'll bet they wouldn't care at all."

"Well, Management would, Al; and that's who you have to convince."

***SHOULD NEW EMPLOYEES** have equal rights to vacation, or must they stick out a waiting period like they always had to do? Is it unfair to penalize a man just because he goes from one job to another at the wrong time of year? Your ideas may guide others. Discussions of earlier topics start on page 242.*

**STERLING SILVER RINGS ARE MACHINED** to 0.0005-in. tolerance, operations include turning, boring, chamfering, and sometimes spinning. Depth of cut and speed varied with individual operators. High-speed and carbide tools worked equally well

# Sterling silver seals recoil

**The combination of a 4 mu in. rms surface in the cylinder and 22 silver rings machined to 0.0005-in. tolerance, then selectively assembled, control the recoil of 155-mm howitzers. Here is how Alco Products does it**

Kid-glove handling is the rule in the manufacture of recoil mechanisms for the Army's 155-mm howitzer at the Auburn, NY, plant of Alco Products, Inc.

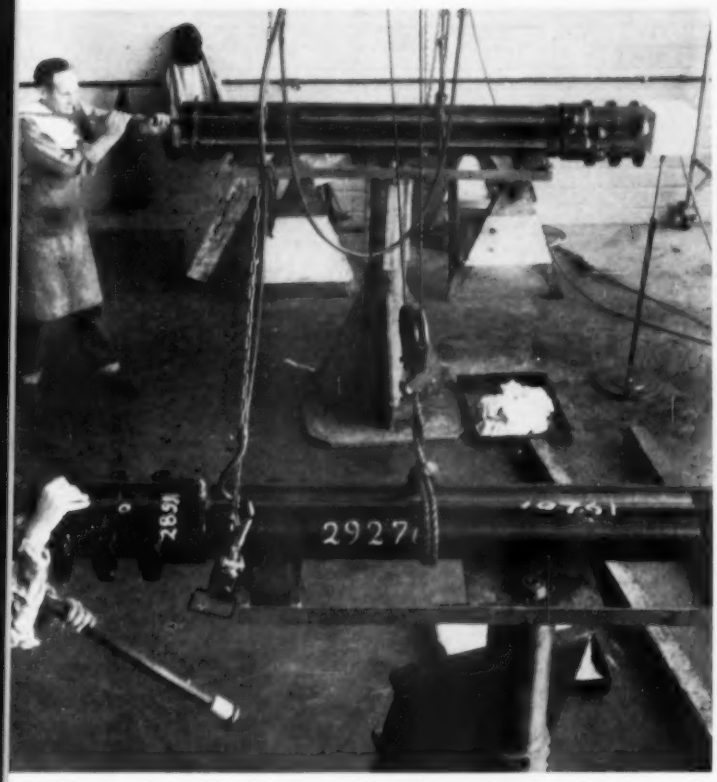
Three cylinders mounted with a heavy cast assembly (through which the howitzer barrel is placed) cushion the recoil and then "ease" the barrel back to its normal position.

There are 22 silver rings, in eight different sizes, machined to 0.0005-in. tolerance and then selectively assembled with Belleville springs, Babbitt inserts, and leather packings to separate the nitrogen in one end from the oil in the other. The piston is inserted in the cylinder with rings selected to provide a 0.0045-in. press fit. The piston is then tightened to compress the Belleville springs and expand the rings to provide the required interference with the bore.

As the shop foreman put it, Alco wondered when the contract was awarded how silver could, or should, be machined. There was little precedent.

Each ring was machined to specifications on a "route tag" that followed each assembly through production. It was found that machining was "critical in that you had to come out with the correct size, but how you did it was not important." Operators turned out finished rings the first day they tried, and throughout the contract there were only a half-dozen spoiled ring blanks, according to the foreman.

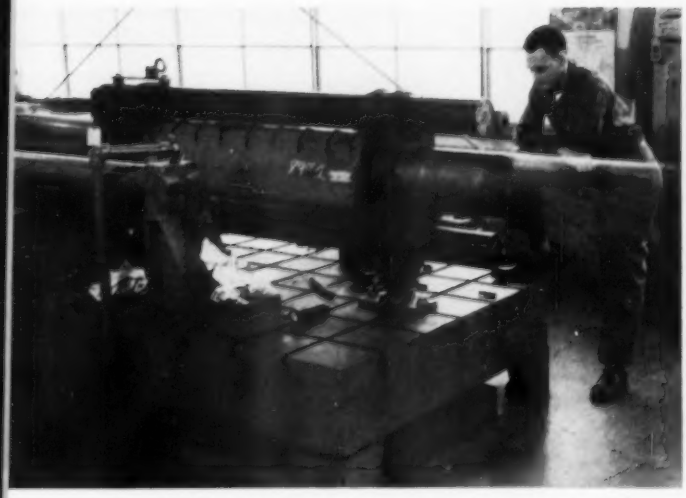
Many rings would have been scrapped were it not for the technique of spinning out the rings that was developed during production.



**LOOKING THROUGH** the 7-ft barrel of the counter-recoil cylinder as surface is inspected. Any scratches on this surface would score the silver rings of the floating piston

**CAST CYLINDERS ARE FIRST HONED** in double-spindle machines, then finished by "stickmen" (left). Working with ramrod-like poles, 320-9/0 sandpaper and crocus cloth, they polish interior surface to remove all radial and longitudinal marks

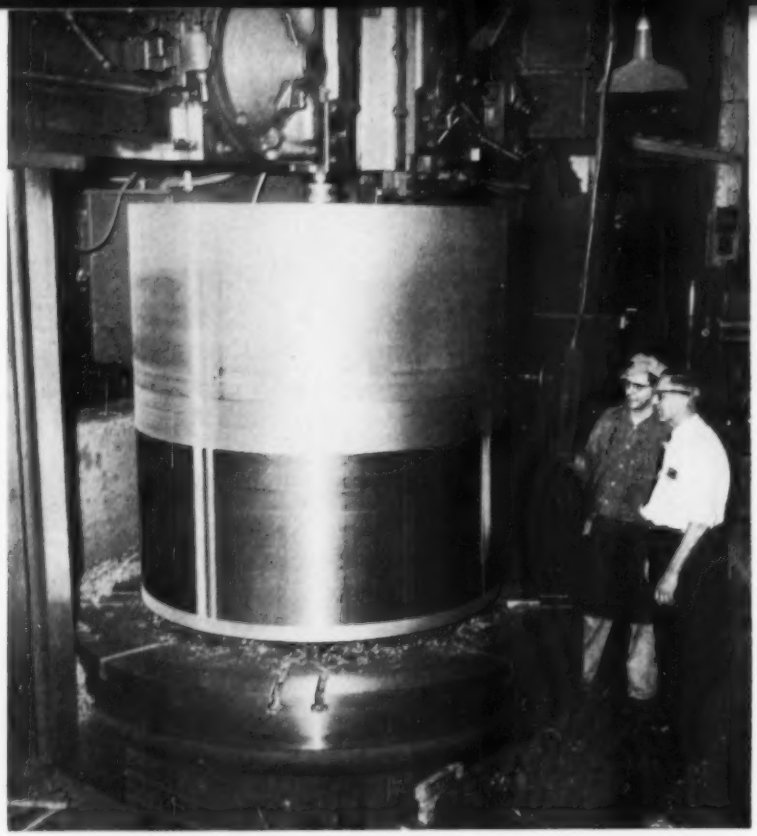
# mechanisms



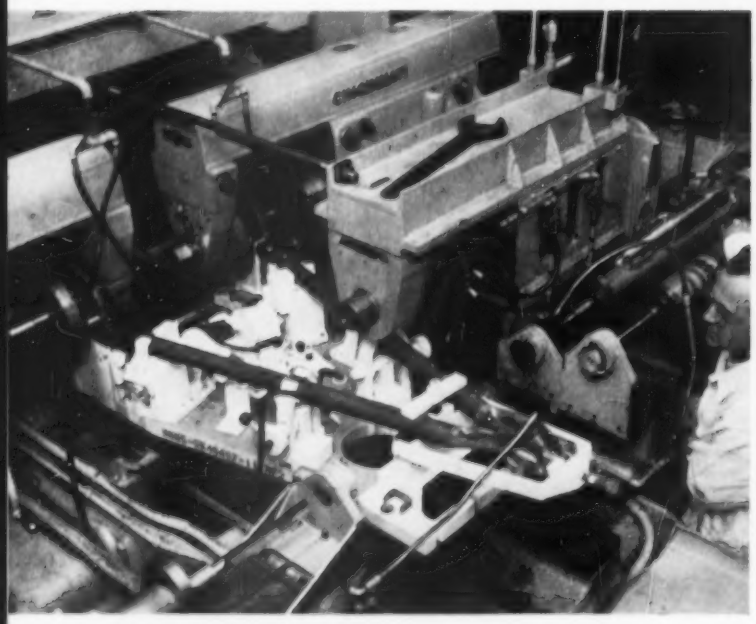
**GYMNASTICATOR TESTS** a finshed recoil mechanism by simulating the firing action. Each recoil mechanism is given about 75 of these dry runs before test firing. The Army also uses gymnasticators to "exercise" recoil mechanisms during periods when the howitzers are not fired

**PISTON IS TIGHTENED** in the cylinder to provide proper interference of the silver rings with the cylinder wall. This is done by two men using dial indicators to take up the piston from opposite ends simultaneously. If the floating piston turns at this stage it will score the cylinder, requiring rehoning

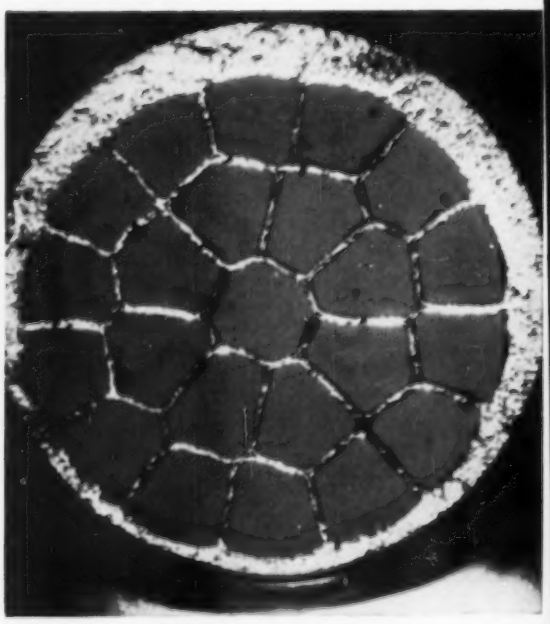
# talented tooling



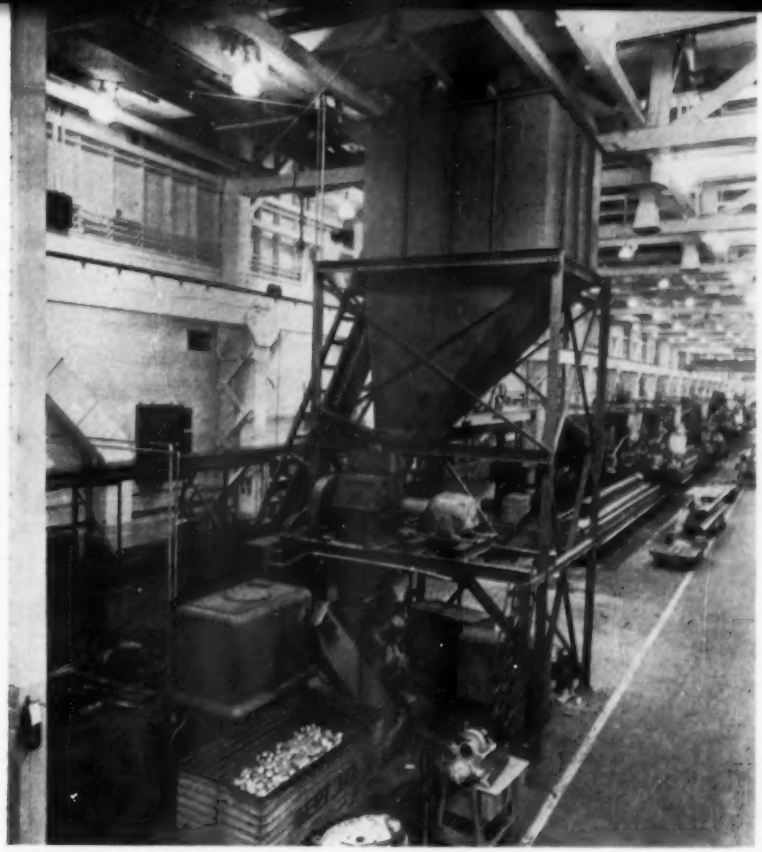
**Live center on boring mill . . . .**
provides extra top support for 60x64-in. conveyor pulley. Center fits under rail saddle and into pulley spider. Finishing tools on the 84-in. Cincinnati Hypro work from the side head. *Dodge Mfg Corp, Mishawaka, Ind.*



**Gun drills work at miller setup . . . .**
to machine arresting hooks for F4D Navy fighters. Cincinnati duplex mill has variable-speed Romulus head with bull gears; this straddle-mills clevis on one leg of hook. Duplex heads gang-mill ends of both legs. Modified Keller air-feed drills cut three holes. All tools are carbide. Operation replaces five old setups; takes 1/5 the time. *Douglas Aircraft Co, Torrence, Calif.*

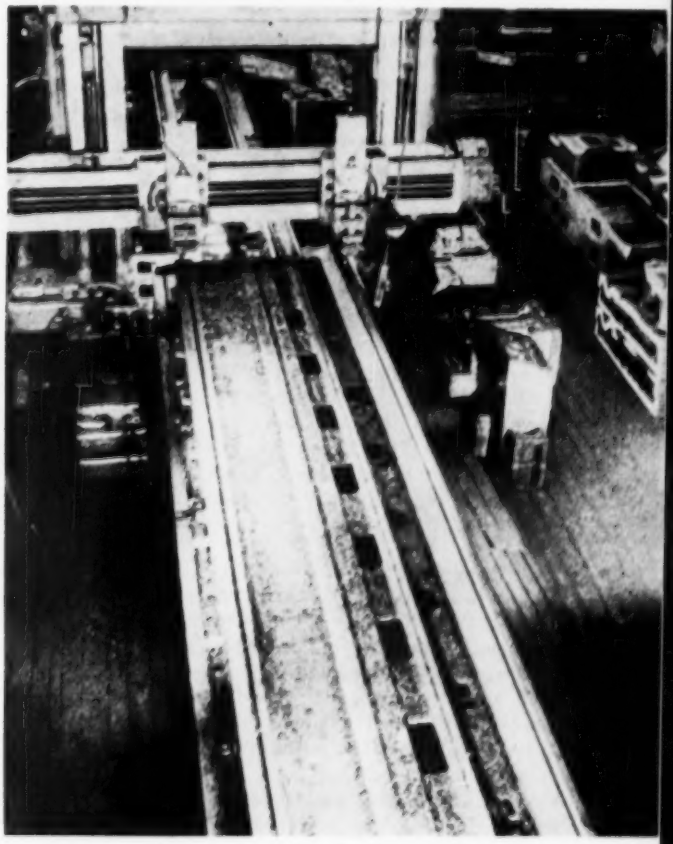


**Tiny grids are made of copper . . . .**
by copper-plating aluminum wire, bunching it inside copper tubing, then reducing it through dies. Disks 0.003 in. thick are sliced off, then lapped to 0.0015-in. thickness. Aluminum is etched away with hydrogen peroxide, and remaining copper grid is etched with ammonia until wires are roughly 0.000,025 to 0.000,050 in. thick. Finally, copper ring around OD is diamond-machined down to 0.022-in. OD. *Varian Associates, Palo Alto, Calif.*



**Spar-mill chips are disposed . . . .**
down the mill flume, strained at the sump, and elevated into hopper. This feeds Jeffrey crusher that reduces them to 3/8-in. size at rate of 1000 lb/hr. Chips (75ST aluminum) are then briquetted in Milwaukee hydraulic press and discharged into mobile carts. Spar mill cuts so fast the chips would flood the area otherwise. Chip-treating space is only 20x20 ft. *Douglas Aircraft Co, El Segundo, Calif.*

**Russian planer tool has unusual shape . . . .**
with edges 120 mm across. Claim is for a six-fold production increase when machining cast-iron bedplates with a rolling cut. *(McGraw-Hill World News)*



**DULL DIAMOND** (left) is not recommended for wheel dressing. On a suitable sharp diamond (right), note the chisel edges and the point on top

# Proper truing and dressing means better toolroom grinding

**Many toolroom grinding troubles, such as chatter, burning, cracking, and rough surfaces, can be traced directly to improper truing and dressing of the wheel. Here, based on a series of controlled tests, is what to do to avoid these troubles**

JOHN A. MUELLER, manager, grinding laboratory
BONDED ABRASIVES DIVISION
THE CARBORUNDUM CO, NIAGARA FALLS, NY

Dressing and truing of toolroom abrasive wheels have long been recognized as integral parts of the grinding operation. The manner in which wheels are dressed controls, to a great extent, quality of the ground surface, rate of stock removal, and dimensional accuracy of the work. The distinction between truing and dressing, however, requires definition to avoid confusion.

## TRUING

Truing is to put the wheel in running truth. All newly mounted toolroom wheels should be trued up on the machine before they are used. To true up a surface-grinding wheel means to bring it into round so its OD is concentric within 0.001 in. with the machine spindle. Obviously, if the OD is not concentric with the spindle, the wheel cannot grind evenly around its periphery. Vibration will then be introduced.

Some of the more obvious effects of vibration are chatter marks on the ground surface, inability of the wheel to hold size, excessive wheel breakdown, and a rough finish on the work. Vibration will also produce pounding in spindle bearings and increase their wear rate. Truing wheels before using is therefore of the utmost importance. This need becomes increasingly important as grinder size becomes smaller. However, all machines, regardless of size, will reproduce the effects of vibration on the finished product.

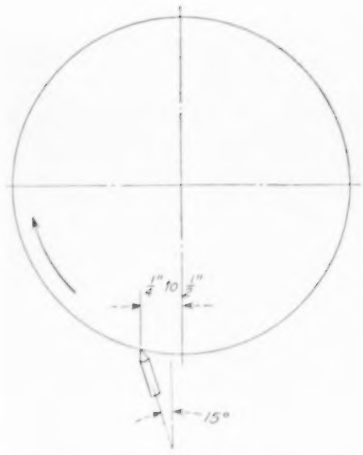
In the case of a cutter-grinding wheel, truing means to bring the cutting face of the wheel into parallel with the horizontal plane of the machine table. The unsatisfactory results produced by an untrued surface-grinding wheel will be produced by a cutter-grinding wheel not put in running truth. In the case of a single-point tool grinder, effects are similar.

Truing then simply means bringing the grinding wheel into running truth, either on the periphery or on the face—or both.

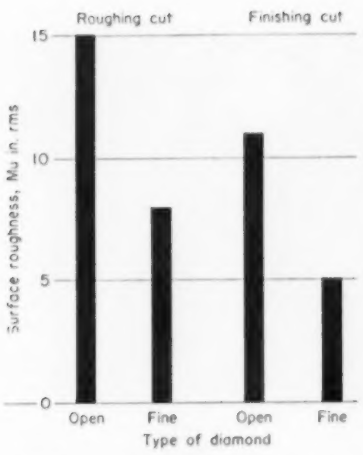
## DRESSING

After a grinding wheel is trued, it is dressed to accomplish a specific purpose. The more common reasons for dressing are:

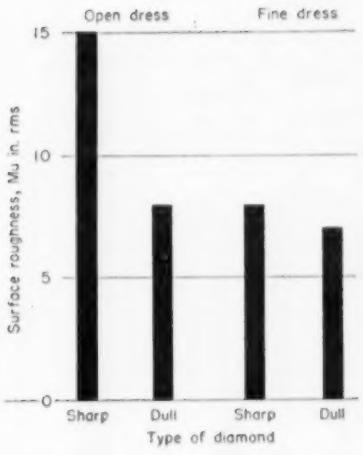
- To restore the cutting face by removing dull abrasive grains and permitting sharp grains to be exposed.
- To remove metallic load from the wheel.
- To remove grinding swarf from the wheel.
- Deliberately to dull the cutting




**CORRECT APPLICATION** of a diamond dresser will keep the diamond in first-class shape by generating new facets




**EFFECT OF FINE** and open dressing on work ground with a 60-grit, ALO grain, vitrified-bond wheel




**EFFECT OF DRESSING** with sharp and dull diamonds on surface quality of work using a 60-grit, ALO grain, vitrified-bond wheel

face to produce a desired finish on the ground part.

• To bring the face of the wheel back to its original shape after it has been partially or completely broken down.

Dressing simply means to condition the grinding wheel so it can accomplish the job for which it was intended.

Dressing and truing of toolroom wheels are generally accomplished by using a single-point diamond, a cluster of diamonds, an abrasive stick, or a nonabrasive stick.

Because the same tools are used for truing as for dressing, the terms are often used interchangeably. However, there is a definite distinction between them, and the effect of dressing a toolroom grinding wheel is often the difference between success or failure of the grinding operation.

## SURFACE-GRINDING WHEELS

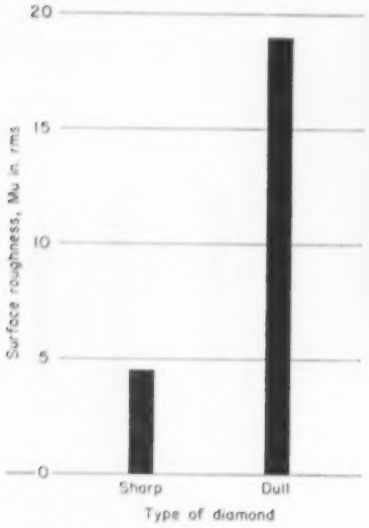
Toolroom surface - grinding wheels are generally dressed and trued with diamond tools. The diamond is inserted in a holder at a slight angle, and meets the wheel as it rotates away from the diamond. Contact is made approximately ¼ to ½ in. offset from the center line of the wheel. At the ½-in. position, chisel edges are generated on the upper portion of the diamond and, as the diamond is moved toward the center of the wheel, the edges move progressively toward the lower part of the diamond. By shifting the position from the ½-in. to the ¼-in. position and back again, and by rotating the diamond periodically at each position, a multiplicity of facets can be generated, and the diamond will be in excellent shape for dressing.

Either an open or a fine dressing can be employed. An open dressing is one in which the diamond is fed into the wheel approximately 0.001 in., then traversed across the face at a rapid rate. A similar infeed is made at the end of each dressing pass and no sparkout passes are taken. This leaves the wheel in a free-cutting condition. A fine dressing is one in which the diamond is fed into the wheel up to 0.001 in. per pass, until the wheel is squared up. Then the infeed is reduced, and finally one pass is taken with no infeed at all. The diamond is traversed across the wheel face much more slowly than in an open dress. This leaves the wheel in a much smoother condition than an open dress.

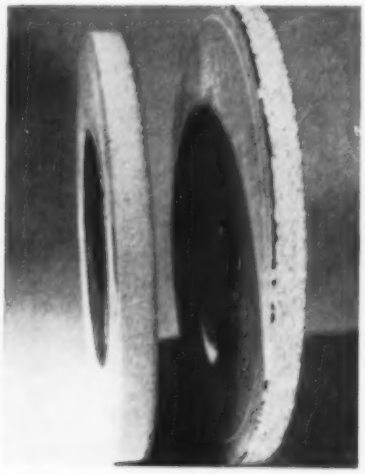
Fine dressing produces a finer finish when either a roughing or a finishing cut is taken with the wheel. Generally, fine dressing reduces the surface roughness by half. There are, however, other factors involved in the grinding operation that are influenced by the type of dressing. On a finish cut, a fine dress is superior to an open dress in surface roughness—and all other effects are the same. On a roughing cut, however, a fine dress produces burn, generates warp and does not maintain flatness as well as the open dress. It

| | OPEN DRESS | FINE DRESS |
|---|---|---|
| Wheel speed, sfpm | 6000 | 6000 |
| Diamond used | Single diamond approx 2 carats | Single diamond approx 2 carats |
| Traverse rate, ipm | 10 | 3 |
| Infeed per pass, in. | 0.001 | 0.001 until wheel face is squared up.<br>Then<br>2 passes at 0.0005<br>1 pass at 0.0002<br>1 pass at 0.0000 |

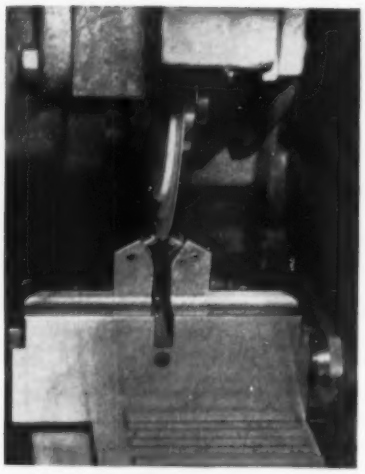
**METHOD OF PRODUCING** an open or fine dress with a diamond dresser




**EFFECT OF DIAMOND** sharpness on work quality is particularly noticeable when fine-grit (120-grit) wheels are fine dressed for finish cuts



**WHEEL DRESSED** with a sharp diamond (left) is dirty, but free from metallic loading. Wheel dressed with dull diamond (right) shows heavy loading. Breaks in loading are caused by metal spalling out and taking part of wheel with it



**OPPOSED-DIAMOND DRESSER** permitted dressing this ¼-in.-thick wheel down to a thickness of only 0.017 in. for cutting narrow slots in hardened steel

also loads the wheel more. This is logical because a fine dress tends to level off the abrasive grains, causing more cutting points to contact the work. This causes the wheel to act harder, which in turn makes it less suited for removing metal and more satisfactory for generating fine finishes. From these findings it can be concluded: use a fine dress for finish cuts; an open dress for roughing cuts.

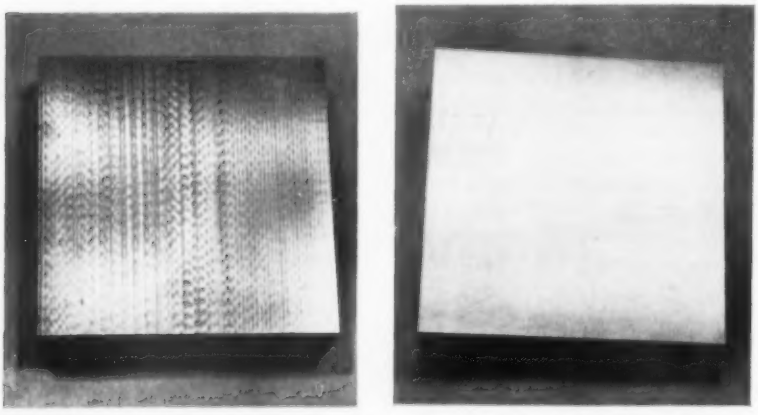
The effect of the sharpness of a diamond is clearly visible on the ground surface. A dull diamond produces a finer finish. However, the advantages of a finer finish are overcome entirely by the other factors that accompany the use of a dull diamond.

A wheel dressed with a dull diamond — whether open or fine — generates more heat, produces substantially more warp in the workpiece and prevents the piece from being ground flat to close tolerance. Obviously, on a roughing cut, a dull diamond is not satisfactory.

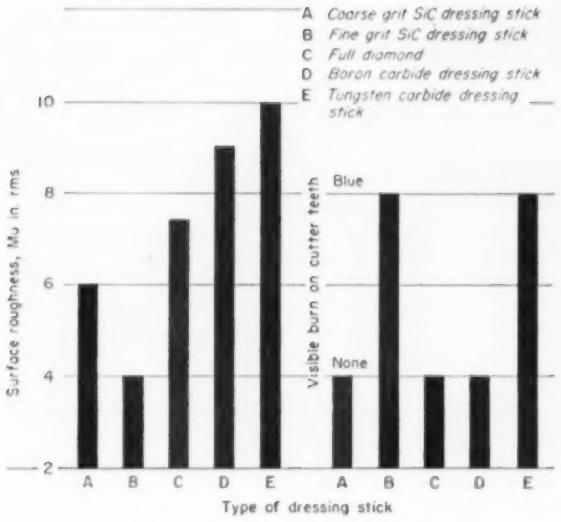
A still greater effect between wheels dressed with a sharp or a dull diamond is noticeable when fine-grit wheels are dressed for finish cuts. This is of utmost importance because fine-grit wheels are used for final cuts, and the results produced with these wheels often determine whether, for example, an expensive die is accepted or scrapped.

Unlike the previous results, a dull diamond produces a much rougher surface than a sharp diamond, because a dull diamond causes excessive loading in the wheel, produces a blue burn on the steel and generates checks in the surface of the metal. Manifestly, the dull diamond effectively causes the wheel to act much harder than designed. The dull diamond produces so great a load that it causes the wheel to spall, which in turn, breaks the wheel down excessively and produces a rough surface on the metal. Such a surface is obviously not satisfactory for any kind of finished product—the burn and check would reject it for any practical use. Metal ground with a sharp diamond, on the other hand, is perfectly satisfactory for use as a tool or die, or for any precision-ground part.

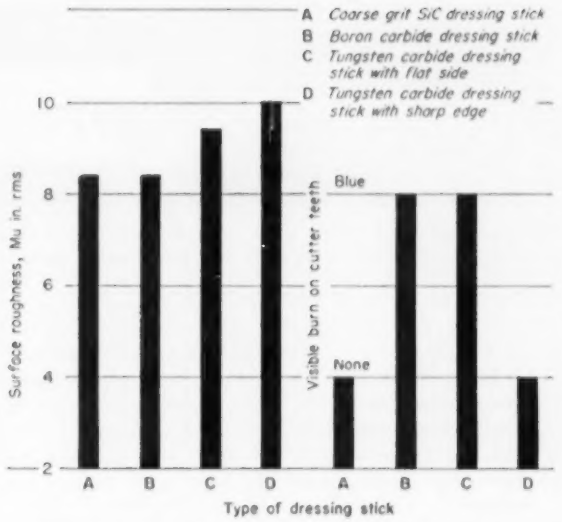
Never use a dull diamond to dress a fine-grit finishing wheel. Remember that the marks generated on a grinding wheel face during diamond dressing will be transferred to the steel during the grinding cycle. The condition of the grinding wheel face before



**SURFACE GROUND** with a fine-grit wheel dressed with a dull diamond (left) shows heavy burn and checks; that produced with a wheel dressed with a sharp diamond (right) shows uniformly good surface free of burn or checks




**SURFACE ROUGHNESS** and degree of burn produced by various dressing sticks on medium-grade, vitrified, 60-grit, ALO wheel




**SURFACE ROUGHNESS** and degree of burn produced by various dressing sticks on a hard-grade, vitrified, 60-grit, ALO wheel

grinding controls, to a great degree, the final finish produced on the ground part.

## SLOTTING OPERATIONS

In dressing toolroom wheels for slotting operations where a thin wheel is required, it is necessary to dress the wheel to the required thickness. In precision dressing of this kind, it is necessary to use a dressing device consisting of two diamonds opposing each other, which are fed into the wheel at the same time. This permits a wheel to be reduced to a very small thickness, because one diamond tends to act as a support to the other during dressing. Without some such dressing device it is difficult to reduce a grinding wheel to a thin section.

To make most effective use of your toolroom surface-grinding wheels and reduce the number of rejects:

- True up all wheels after mounting on the grinder.
- True up all wheels if they are taken off the grinder and then replaced.
- Always use a sharp diamond.
- For roughing cuts, use an open dress.
- For finish cuts, use a fine dress.
- To dress wheels to small thicknesses, use an opposed dressing device.

## TOOL AND CUTTER WHEELS

Dressing a cutter-grinding wheel is equally as important and effective as dressing a surface-grinding wheel. Generally, abrasive or carbide sticks are used. The dressing stick is held in the hands and manipulated to dress the rotating wheel.

To evaluate the effects of various dressing sticks upon the surface finish obtained and the degree of burn developed when grinding the primary land on a cutter, a series of tests was made with 60-grit wheels of both medium and hard grades. The results are shown in accompanying charts. On medium-grit wheels, a fine-grit, silicon-carbide dressing stick produced the best finish; however, it burned the cutter very badly. This was logical because fine dressing for surface grinding also produced a smooth finish but burned the work. A fine dressing stick made the wheel act too hard. In order of their ability to produce a fine finish, the fine-grit silicon carbide stick was followed by the coarse-grit SiC stick, then successively by the dull diamond, the boron-carbide and the tungsten-carbide dressing sticks. The fine-grit SiC and the tungsten carbide both produced burn.

The other media produced a burn-free surface. The best dressing medium for producing such a finish was the coarse-grit SiC stick. Results were conclusive that this was the most versatile for dressing and the one that would give the best over-all performance.

Dressing a hard-grade 60-grit wheel with various dressing media produced results that were pronounced and decidedly different. Surface roughness ranged from 8 to 12 mu in. rms, and the quality of the ground surface ranged from no burn to blue burn. The best over-all performance was obtained with the wheel dressed with the coarse-grit SiC stick.

Dependability of these results was strengthened by an examination of the wheels after grinding. The wheel dressed with the coarse-grit SiC stick was relatively free from swarf and glaze, while the wheel dressed with a boron-carbide stick was heavily filled with swarf and glazed. It is reasonable to assume that such a wheel will tend to burn.

The effect on the cutter was also obvious. A cutter, ground with a wheel dressed with a coarse-grit SiC stick, showed no burn, while that ground with a wheel dressed with a boron-carbide stick definitely showed a burn.

Summing up the effects of vari-

**MILLING-CUTTER TEETH** (left) ground with a wheel dressed with a boron carbide stick are badly burned on the primary land; those ground with a wheel dressed with a SiC stick are free of burn

| WHEELS DRESSED WITH SHARP DIAMONDS | WHEELS DRESSED WITH DULL DIAMONDS |
|---|---|
| • Generate less heat | • Build up heat |
| • Produce better finish | • Produce burn |
| • Prevent warp in work | • Generate warp |
| • Maintain accurate dimensional flatness | • Prevent accurate dimensional flatness |
| • Minimize wheel loading | • Induce wheel loading |
| • Permit easier dressing | • Make dressing difficult |
| • Allow wheel to grind according to grade | • Cause wheels to act harder than specified grade |

**DIFFERENCE IN PERFORMANCE** of grinding wheel dressed with a sharp or a dull diamond shows why dull diamonds should be avoided

ous dressing media on the final finish; the dressing stick that produced maximum wheel efficiency was a coarse-grit SiC. The wheel dressed with this stick produced a low mu in. surface roughness on the cutter and a surface free from burn. It dressed coarse-grit and fine-grit wheels without interfering with or altering the nominal grit size. It produced the most versatile performance with the least trouble.

A fine-grit SiC stick tended to glaze the wheel and change its nominal hardness. It effectively made the wheel act harder and produced all the characteristics typical of a wheel that is too hard for the job.

Carbide dressing sticks, as the results indicated, are not nearly as versatile in their performance as coarse-grit SiC sticks. When used on their edges, they opened up the wheel too much and caused it to generate a rough finish on the cutter. When used on their flat side, they closed up the wheel face, glazed it, and increased the effective hardness. This produced burn on the cutter and would cause it to be rejected. This effect was noticeable in roughing wheels; and as the wheels became finer and harder, the effect was very much aggravated.

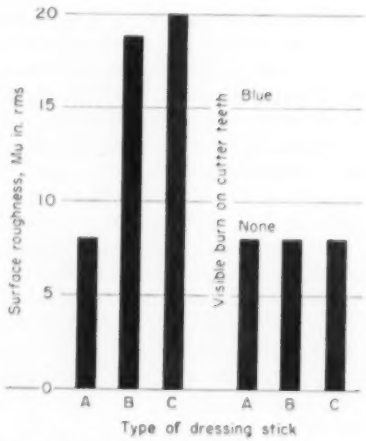
As far as the final grind is concerned, the width of the land left on the wheel to do the grinding is as important as the type of stick and method used to dress the wheel. Land width is the grinding face of the cutter-grinding wheel and, because it does the grinding, it is the most significant part.

Generally, each operator dresses the land to suit his particular requirements. This dressing has a profound effect on wheel performance. Altering land width changes pressure applied to each grit during grinding. The wider the land, the less pressure is applied per grit, therefore the less wheel breakdown. Conversely, the narrower the land, the greater the pressure applied on each grit, and the more the wheel breaks down.

In tests made with three consecutively harder grades of the same wheel, the softer H grade was able to grind a high-speed cutter with the full ¼-in. width of land without burnings. The next harder I-grade wheel burned the cutter with a full ¼-in. width of land. To eliminate the burn it was necessary to reduce land to 3/16 in. The hardest-grade J wheel burned the cutter with a ⅛-in. land, and it was necessary to reduce this to 1/16 in. to grind without burning. This points up a number of basic concepts that can be used in the everyday application of cutter-grinding wheels. The fundamental concept is that pressure per grit applied to the grinding wheel controls wheel performance to a great extent. From this, other principles can be resolved:

- To grind large cutters, use softer-grade wheels.
- To grind small cutters, use harder-grade wheels.
- For wide land faces, use softer-grade wheels.
- For narrow land faces, use harder-grade wheels.
- To minimize heat buildup, use narrow land widths.
- To produce maximum versatility from the grinding wheel, alter the width of the land to suit the operation.

Toolroom grinding wheels will perform only as well as they are trued and dressed. Maximum wheel efficiency can be obtained if the wheels are in running truth and have been dressed to fit the grinding operation they are called upon to perform.




A. Coarse grit SiC dressing stick
B. Boron carbide dressing stick
C. Tungsten carbide dressing stick

**SURFACE ROUGHNESS** and degree of burn produced by various dressing sticks on a hard-grade, vitrified, 46-grit, ALO wheel. Note the advantage of the SiC stick

# *Salvage inspection committee saves*

## ·TIME ·MONEY ·TEMPERS

R W COOLBAUGH, quality control manager, AMERICAN MACHINE and FOUNDRY COMPANY, BUFFALO, N Y

Salvage of rejected parts must fulfill a number of requirements. Among these, two of the most important are that the maximum value be retained, at the established quality standard, and that the cause of rejection be determined and corrected. In other words, it is important to salvage both the product and the process.

Thus, a small group of specialists at AMF is organized into a salvage committee and charged with the responsibility of screening all rejected parts for rework possibilities. Normally, this committee comprises two persons—the Salvage Coordinator and a member of the engineering department. When the customer is the US Government or an aircraft manufacturer, the customer's representative is added.

Training and experience are important prerequisites for committee members. They must be *broad and thorough*. Although the Salvage Coordinator reports to the quality control department, his training is largely one of methods and tool engineering. The engineer committee-member must know his product, its specifications, and application. Usually, *he is the product engineer on the job.*

Customarily, the committee meets one day each week and reviews all of the material accumulated since the previous meeting. However, in special circumstances or for a major problem, a special meeting can be called at any time.

If it appears that reworking a rejected part will never make the part meet the customer's specifications, details of the discrepancy are described in a *Discrepant Parts Report* which is presented to the Salvage Board for decision and disposition. Members of the Salvage Board review this description of the discrepancies, estimate rework cost involved, and consider possible use of the item in final assembly. Records are reviewed for the number of past occurrences of the same defect and corrective action is started to eliminate repetitive discrepancies.

### FOLLOW-UP IMPORTANT

A *Corrective Action Request* form is filled out stating: 1) nature of the defect; 2) the suspected cause; 3) relevant facts about the operator, material, or process; and 4) suggestions for solving the problem. A follow-up system controls the Corrective Action Request through Planning, Tool Engineering, Product Engineering, or other departments until positive action has been taken. Acceptance of material submitted to the Salvage Board requires concurrence of all members before salvage begins.

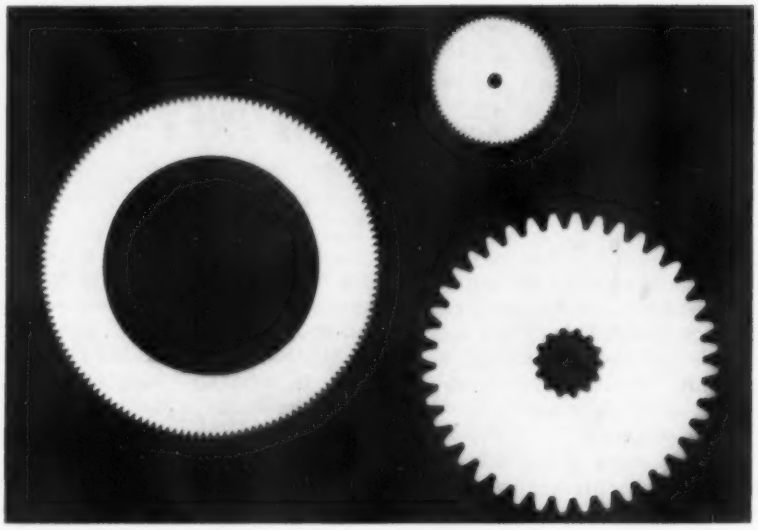
For example, the AMF Buffalo Plant is manufacturing a large pressure vessel, with thin walls, to 0.0002-in.-dia tolerance. The material is high-alloy steel, rolled, welded, and X-rayed. It must meet special government specifications. Considerable difficulty was encountered in holding dimensions and a 32 mu-in. rms surface finish. Normal procedure would be to scrap an obvious reject. The Salvage Committee reviewed the facts and discussed them with metallurgical and X-ray laboratory personnel. The group was able to recommend a rework procedure which resulted in parts meeting requirements of the customer—and saved thousands of dollars.

In many instances the engineer on the Salvage Committee has been able to obtain more realistic tolerances from the customer. By investigating the cause of repetitive troublesome dimensions, changes in tooling were suggested which enabled manufacturing to improve techniques. By initiating corrective action and calling the shop foreman's attention to specific cases, he was able to improve his method of employee training. In some instances where a tool was found not to be foolproof, recommendations were forwarded to the tool liaison man who corrected the design.

AMF purchases a great variety of electronic and mechanical equipment. Salvage action may be only inspection-screening for usable pieces. Re-plate and/or reheat is common; so is snag, burr, paint, adjust, degrease, resolder, grind to finish specifications, or even rewire a circuit or change the stencil on a transformer. Many purchased items are rejected by Quality Control at times when a shortage is critical and could jeopardize delivery schedules. By a procedure similar to the internal discrepancy review, the Salvage Inspection Committee reviews the case and takes action by analyzing the Discrepant Parts Report and suggesting a possible rework method in lieu of returning parts to a distant vendor.

In most instances the Purchasing Department buyer is asked to sit in on these cases. He is the official liaison man with the vendor. After he has come to some understanding with the vendor, action is authorized and started.

Charges for rework are tabulated on cards, and upon consultation, the vendor will quite often accept a cost adjustment rather than have the goods returned at his expense. These and other Quality Control records reflect each vendor's ability to meet quality and schedules, thereby permitting us to maintain high quality standards and meet delivery dates on products using purchased items.



**GEARS MACHINED FROM BLANKS** include fine-pitch instrument gears and heavy-duty test gear. Spline inside gear (lower right) was broached to tolerance of 0.0005 in.

# How to cut nylon gears

**Precision gear teeth can be cut in nylon using conventional hobs and shaping cutters. Feeds and speeds are the same as those used with brass. Where molded gears are not accurate enough, or where limited production does not justify the cost of a mold, teeth can be cut in molded blanks or bar stock**

Zytel 101, a type of nylon produced by duPont, is well suited for the manufacture of gears. Most gears of this material have molded teeth, hence need no machining, but where greater accuracy is needed, machining operations can be done to close tolerances.

The first step in preparing a blank is to moisture-condition it by placing it in boiling water for a predetermined length of time, then allowing it to dry at room temperature for two weeks. If gears are to be made from molded bar stock, it is best to cut the blanks first, then moisture-condition them, rather than to condition a larger piece.

Fairly high surface speeds with light feeds, such as 115 sfpm and feeds of 0.010 to 0.15 ipr, produce good results. The speed should not be high enough to cause over-heating, and the cutter must be very sharp. Cutting practice is similar to that used for brass.

Resilience of this material causes "springback" after the cutter has passed. However, it is not enough to have any harmful effects on tooth size or shape. For example, 100 gears of 2½-in. dia, with 16- and 20-pitch teeth, cut with a class A hob, were within AGMA commercial 3 tolerances, while many were within precision 1 tolerances.

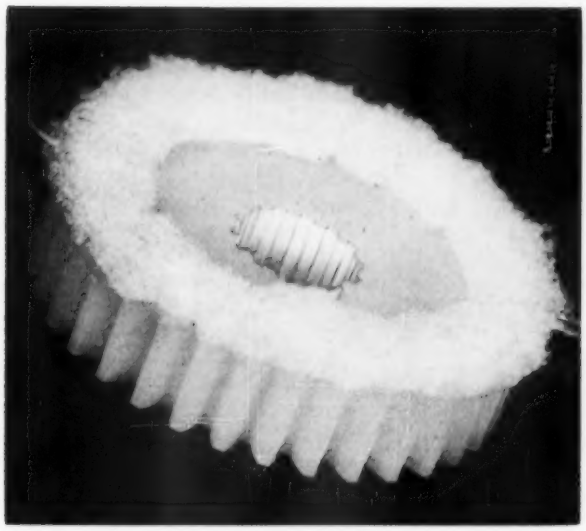
Actually, this resilience is used to advantage in laminated gears (metal-nylon-metal) where the nylon juts out slightly after the whole sandwich is machined at one time. The excess nylon takes up backlash, increasing accuracy of the assembly. For greater protuberance, the gears are machined first, then the moisture treatment is applied. This technique will decrease accuracy slightly.

When gears that aren't laminated are cut, it is best to mount a brass washer on the side where the cutter leaves the gear. This will considerably reduce burrs.

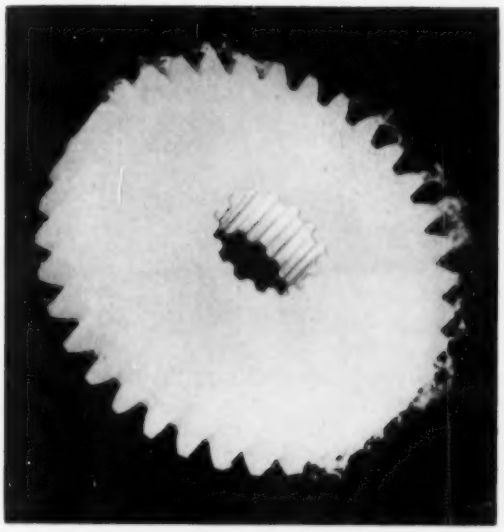
The material is supplied in granulated form and lends itself to conventional molding. It is lightweight and rigid, but not brittle. Its properties are:

| | |
|---|---|
| Tensile strength (70 F) | 9300 psi |
| Elongation (70 F) | 220% |
| Modulus of Elasticity (73 F) | 200,000 psi |
| Shear strength | 8000 psi |
| Hardness, Rockwell | 108 $R_R$ |

Temperature affects these properties somewhat. At higher temperatures the impact strength and percent elongation increase, while tensile strength and modulus of elasticity decrease. Moisture content also affects these properties and dimensional stability of the finished product. When the material is conditioned after molding, to a moisture content of 2½ to 3% by weight, it has good dimensional stability. Properties shown above were arrived at under these conditions.

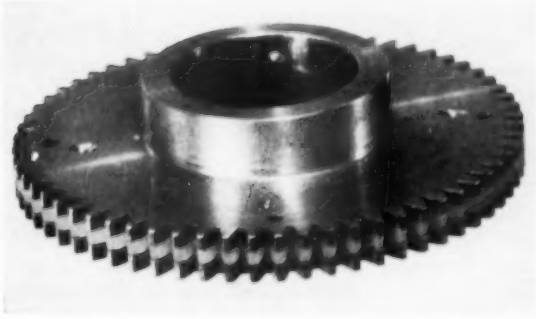


**WITHOUT BACKUP WASHER,** cutter leaves heavy burrs on exit side of gear. These must be shaved away with a sharp tool

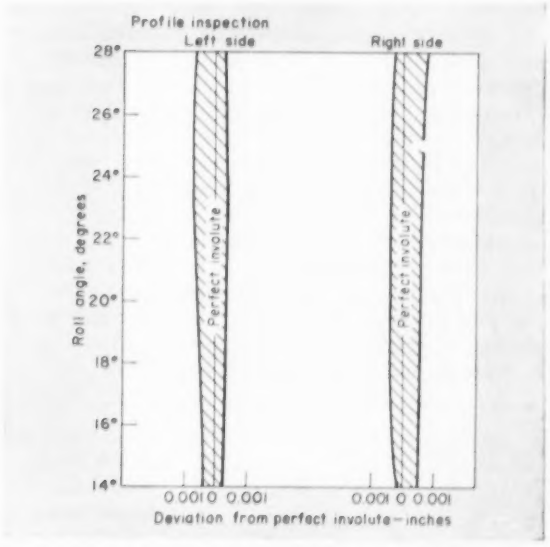


**WITH A BACKUP WASHER,** cutter leaves only a few fine burrs, easily removed with dry 240-grit emery paper and a rotary fiber brush

KEITH W HALL and HERBERT H ALVORD
associate professors, Mechanical Engineering
UNIVERSITY OF MICHIGAN
NELSON J KREIDER project engineer
JOHN OSTER MANUFACTURING COMPANY



**LAMINATE GEAR** has Zytel section in the middle to take up backlash. Even though assembly is cut at the same time, nylon's resiliency makes it protrude slightly beyond steel gear teeth. This condition can be used to advantage in instrument gearing where complete lack of backlash is of prime importance

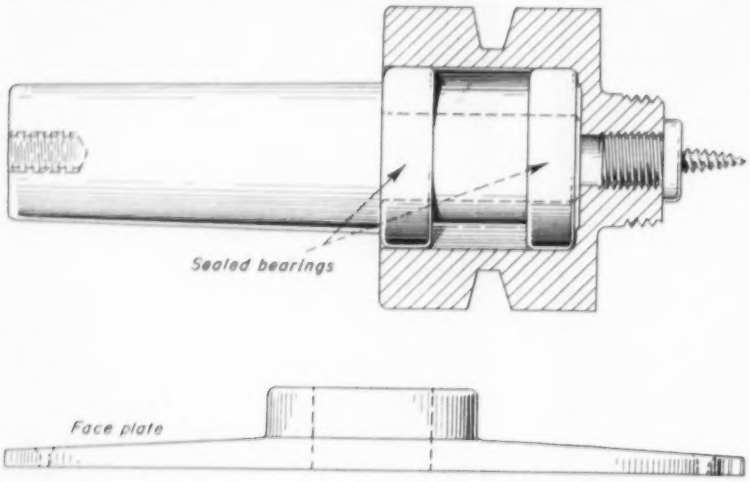



**TESTS MADE** on a Fellows profile-checking machine, on three teeth on each of ten 16-pitch gears, placed all measurements within shaded bands shown. Composite errors, found with a Kodak Conju-Gage on the same gears, are below

| OPERATION | ACCURACY OBTAINABLE |
|---|---|
| Turning | 0.001 in. |
| Facing | 0.001 in. |
| Drilling | same as with metal |
| Boring | 0.001 in. |
| Reaming | 0.002 in. |
| Broaching (spline) | 0.0005 in. |
| Hobbing | AGMA Commercial 3 |
| Shaving | AGMA Precision 1 |

**ALL MACHINING OPERATIONS** performed on Zytel gears were equally successful. Table shows tolerances obtained on one hundred gears

# Practical Ideas . . .




## Subhead Allows High-Speed Turning

Most of our patterns are shop made, requiring a good percent of turning. The 18-in. engine lathe we use for this purpose is too slow; this is the reason for using the illustrated subhead.

It is inserted in the headstock spindle and secured with a drawbar. The motor drive is mounted on a bracket, hinged on the back side of the lathe. I keep a collection of different dia pulleys, one for each speed requirement.

With this arrangement I can use the power feeds of the lathe, as well as a wood-turning tool rest. A 3-in. and an 8-in. faceplate are used in turning different size disks or flat work.

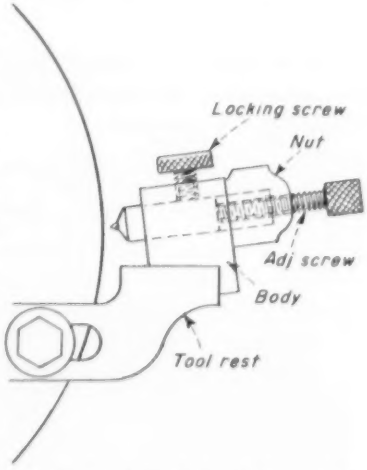
The subhead consists of a tapered-shank mandrel fitted to the headstock spindle, the forward end carrying two sealed ball bearings. A spacer serves to maintain proper distance between bearings. The housing is bored to a pressed fit over the bearings; the forward end is threaded to take the work-driving plugs. On this end is also cut a male thread to suit the faceplates. A V-belt groove is machined in the center of the housing.

*Erwin D Peterson, Moorhead, Minn*

### Diamond Tool-Grinder Dresser Does Better Job

The work in our shop demands a true and unbroken surface on the periphery of the shop grinder wheel. After failing to get this with the conventional wheel dressers, I made the illustrated diamond-holding fixture. In its application it is firmly held down on the tool rest with the heel of the fixture solidly against the outer edge of the tool rest. With the locking screw only lightly tightened, the diamond is introduced to the wheel by turning the adjustment screw.

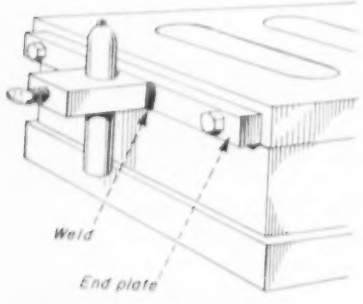
In its construction I used a piece of mild steel for the body, 1¼-in. square by 3-in. long. The rest of the parts are made of brass.




A male thread (not shown) is first machined on the back side of the body to take the nut. A hole is drilled and reamed through the same center to receive the diamond mount. The base of the body is machined to 15°, the angle recommended for wheel dressing by manufacturers of abrasive wheels. A heel is left on the base to act as stop, and should be left the full length of the body.

To use it, we place the fixture on the tool rest, turn the adjustment screw to touch the diamond to the wheel, then slide it along the tool rest to complete the cut. Repeat, feeding in and moving across, until grinding surface is clean and true.

*R Johnston, Glasgow, Scotland*



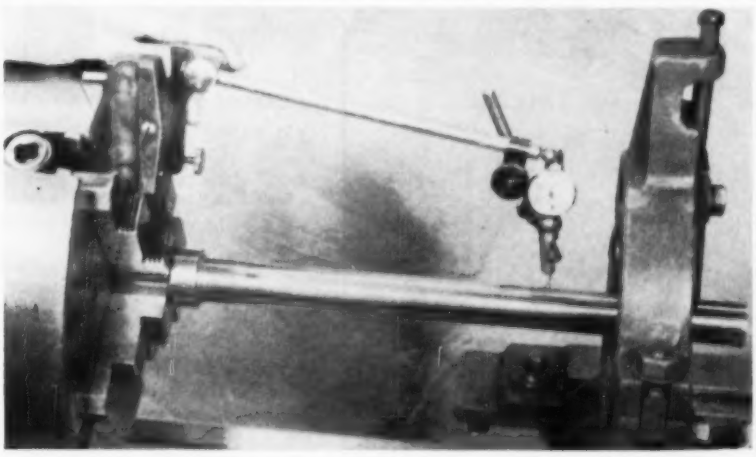

### Attached Holder Block Keeps Diamond Handy

I made a diamond-holder block for our surface grider, and permanently fastened it to the end of the chuck. It is particularly useful when the wheel needs truing at a time when work is set up and should not be disturbed, or when chuck is crowded and leaves no room for the regular diamond holder stand to be used.

Using a long diamond holder, the wheel can be dressed by adjusting the holder vertically to engage the wheel. This will help save time, for it will lessen the need for raising or lowering the wheel excessively.

Since the diamond is on the extreme end of the chuck, it will not interfere with the work. Another advantage is that the grit dressed off the wheel will not settle on the work or chuck. A smart trick is to hang a dampened rag over the table guard to catch much of the dust and grit that would normally strike the guard and rebound.

*W R Konle, Granada Hills, Calif*



## Indicator And Surface Gage Checks Steadyrest Alignment

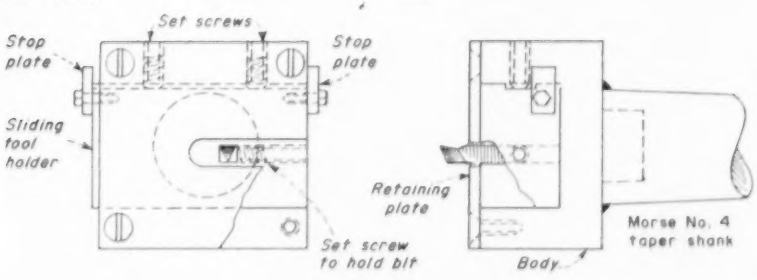
Here's a method of making sure a chucked shaft is running true in its steadyrest supported end. It's simple but effective and requires only a standard surface gage and a dial test indicator.

Assuming the peripheral and face surfaces of the chuck are true, the first step is to chuck the shaft and indicate it adjacent to the chuck. Next place steadyrest in its proper location, and fasten. The jaws are then moved in to touch the shaft.

To check shaft, fasten dial indicator as far out on the rod as is practical, and place surface gage on chuck, with the two retractable pins resting on the peripheral surface.

A test is now made at the points in line with the rest jaws. If the indicator shows a runout at any of these positions, the corresponding rest jaw is adjusted so all readings are the same.

*H J Gerber, Stillwater, Oklahoma*




## Tailstock Tool Makes Ring Grooves

On the parts we manufacture there is an average of two different diameter ring grooves on the same surface. Instead of having two tools to do the job, this tool was made. It has eliminated extra handling and tool changing.

In order to change from one diameter to another, simply loosen setscrews, slide toolholder over against the other stop, and retighten setscrews.

After ring diameter has been determined, stops can be made to suit any condition, whether toolholder is flush, recessed, or extending over end of body.

The body is squared, and a pilot is turned on the back face to fit into a purchased Morse-tapered sleeve suited to the tailstock. These are later welded together. The front of the body is milled to take toolholder slide and holes drilled and tapped for the retainer plate screws. Top of body is drilled and tapped for setscrews.

Retainer plate has clearance slot milled to allow for free movement of toolbit.

Toolholder slide is made to fit slot in body, with a relief slot for the setscrews. Length is machined to individual requirements, depending on groove diameters wanted.

*Robert E Kiehl, Sheboygan, Wis*

### Drill and Tap Combination Works Fast

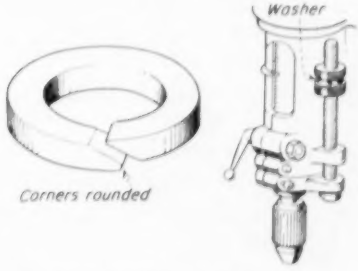
We had a large number of holes to drill and tap in thin-walled steel fittings. For the purpose of saving time in the elimination of a second handling, a drill-and-tap combination was devised.

Using a two-fluted tap, the starting end was ground to a drill point, with rake and clearance as on an ordinary drill.

The drilling and tapping was thus done in a single operation with the aid of a tapping head.

We have successfully drilled and tapped metal up to 3/16-in. thick, using a ¼-20 tap without grinding a special long drill end on the tap.

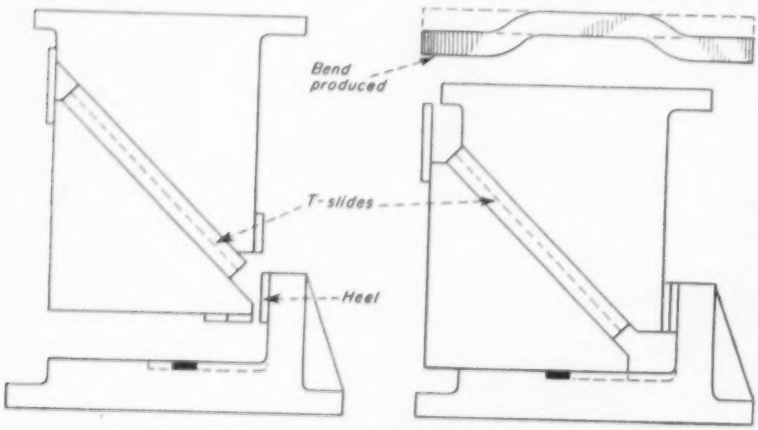
*Ted Hilger, Andale, Kansas*




### Spring Washer Locks Depth Nuts

The locknuts on the depth bar of a drillpress sometimes have a tendency to loosen after a few holes have been drilled. And at other times they will jam so it is almost impossible to unlock them. A large spring washer will remedy these situations without much labor. The only alteration that has to be done before the washer is installed, is to round off the corners so it will not dig into the nuts.

*Stanley Clark, Bradenton, Fla*




## Skid Die Saves Metal With Edge Bend

We had an order to produce a large number of parts designed to be used as front ends of truck-chassis side members. Instead of blanking them out, we designed this skid die to edge-bend them, thereby realizing a saving in material.

The original die was made to bend 7/32-in. thick steel, but can easily be altered to bend any thickness from 1/16-in. to ¼-in. by making the step to suit the thickness. Most any shape can be edge-bent, up to the allowable elongation of the material.

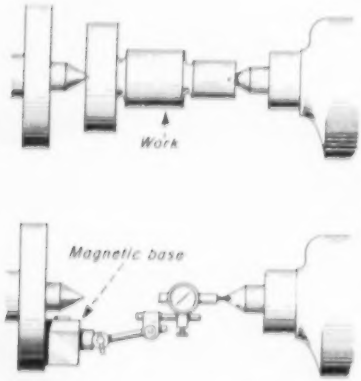
Later a larger die was made to edge-bend the entire length of a passenger-car side member, including the kick-up over the rear axle. In this full-length die four strips were bent simultaneously.

The faces of the punch and die were hardened, ground, and chrome-plated. However, Ampco bronze can be used with equal satisfaction.

As the punch contacts the work, it skids towards the strip, pushing it edgewise into the shape of the die. Wrinkles cannot develop because the die is in closed position during the bending operation.

In open-hearth steel of 18 to 25 points carbon, allowable elongation is about 30%.

*George F Oliver, Warren N Y*




## Tailstock Center Checked With Indicator

When close-tolerance turning or grinding has to be done in the lathe, it is important that the tailstock center be in absolute center of rotation. The use of a test bar may not be accurate enough, as the length of the bar and the work may not be the same, requiring resetting of the tailstock.

We first set up our centered piece between centers, noting exact location of tailstock spindle. The center is then retracted to remove work; spindle is advanced to position it was when work was in place, and locked.

A magnetic-base indicator placed on the faceplate and adjusted to bear on tailstock center will show deviation from alignment when headstock spindle is rotated by hand.

Adjust tailstock to give zero reading front and back, reclamp tailstock, and recheck.

*Robert J Lamp, Sayville, N Y*

**Winners No. 253**

**CARLOS PEREZ**
**H J GERBER**

**won $25 in addition to regular payment for their ideas:**

**Tapering Threading Attachment**

**Turret Work Support**

**in the issue of June 18, 1956**

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

**PAYMENT**—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

**JUDGES**—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

**REQUIREMENTS**—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

**WHO MAY ENTER**—Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

**HOW TO ENTER**—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

# Ingersoll Cutter Grinder

**SAVES UP TO 5 1/2 HOURS OF EVERY WORKING DAY**

Customers using the new Ingersoll Cutter Grinder report time savings of 24% over older Ingersoll machines and up to 70% over standard tool grinders . . . 2 to 5½ hours of an 8-hour working day.

How do your grinding times compare with these?

**12 minutes**

**6" Type NX**
**10 HSS blades**

**40 minutes**

**10" Shear Clear**
**20 T.C. — tipped blades**

**50 minutes**

**10" Shear Clear**
**38 T.C. — tipped blades**

To demonstrate time savings available in your grinding room, we would like to actually sharpen some of your cutters on a new Ingersoll Cutter Grinder. Just write and ask us to have an Ingersoll cutter engineer make the arrangements.

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BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
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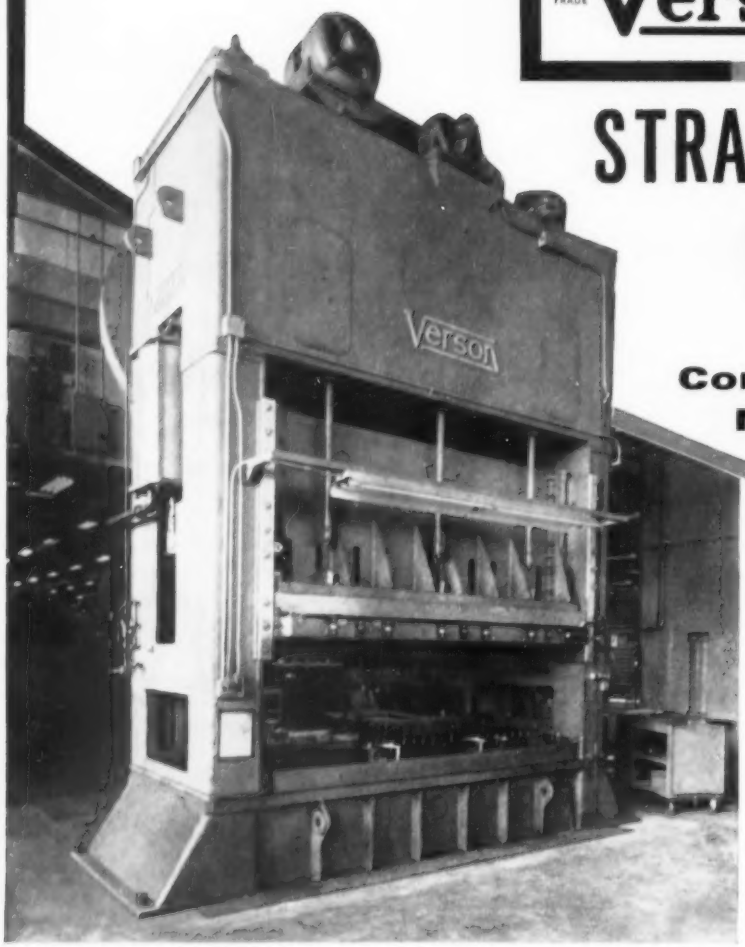
**make Contract Stamping More Efficient**




400 ton Verson Allsteel double crank, single action press used for a variety of large area stampings at Northern Metal Products Co., Franklin Park, Illinois. Bolster area of the press front to back, right to left, is 60" by 120".

Versatility, adaptability and top quality performance of Verson straight side presses are allowing the contract stamper to bring production line efficiency to his shop. An example is this 400 ton Verson double crank press shown above, used for large area stampings at Northern Metal Products Co., Franklin Park, Illinois.

Verson Allsteel Straight Side Presses utilize the great uniform strength of rolled steel plate for their frames to minimize tool damaging deflection . . . and provide cleaner stampings, better draw section and savings in tool dollars. Square type gibs insure perfect alignment—nonoscillating adjusting screws assure long life and easily maintained accuracy.

This is the type of engineering for which Verson presses are noted. To a contract stamper it means greater efficiency and production with reduced costs.

We will be happy to provide you with specific recommendations on a Verson press for your operation if you will send an outline of your requirements.

*A Verson Press for every job from 60 tons up.*

TRADE Verson MARK

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

**VERSON ALLSTEEL PRESS CO.**

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# TAP-DRILL SELECTION . . IV

WARREN G OGDEN, JR, methods engineer, Instrumentation Laboratory
Department of Aeronautical Engineering, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

## Suggested Percentages of Thread for Various Materials

### FERROUS MATERIALS

| | |
|---|---|
| Steels: | |
| A 5150 | 60 |
| B 1111 | 70 |
| B 1112 | 70 |
| B 1113 | 75 |
| C 1010 | 60 |
| C 1020 | 65 |
| C 1025 | 65 |
| C 1040 | 65 |
| C 1095 | 60 |
| E 4340 | 65 |
| E 4640 | 65 |
| E 52100 | 60 |
| High chrome-high carbon | 50 |
| High speed | 55 |
| Manganese steel | 55 |
| Tool (low tungsten, chrome and carbon) | 60 |
| Cast | 65 |
| Stainless Steels: | |
| Type 302 | 50 |
| 303 | 60 |
| 309 | 50 |
| 310 | 50 |
| 316 | 50 |
| 345 | 50 |
| 410 | 55 |
| 416 | 60 |
| 430 | 55 |
| 446 | 55 |
| Irons: | |
| Cast Iron (soft) | 75 |
| " " (medium) | 70 |
| Cast Iron (hard) | 65 |
| Malleable | 75 |
| Wrought | 60 |
| Ni-Resist | 60 |
| Stainless iron | 65 |

### SPECIAL MATERIALS:

| | |
|---|---|
| Fansteel | 50 |
| Hevimet alloy | 50 |
| Mallory 1000 metal | 50 |

### NON-FERROUS MATERIALS

| | |
|---|---|
| Aluminum | |

Thread lengths should be increased from 10% to 40% as compared to length of engagement in steel

| | |
|---|---|
| Wrought Alloys | 65 |
| Cast alloys | 75 |
| Ampco Metal | 55 |
| Beryllium copper | 60 |
| Beryllium metal (pure) | 50 |

The use of serial taps is recommended even with 50% thread height, to prevent this very brittle metal from crumbling on the crest of thread.

| | |
|---|---|
| Columbium | 50 |
| Copper and copper-zinc alloys (hard-tempered) | |
| Electrolytic tough pitch copper | 55 |
| Oxygen-free copper | 55 |
| Yellow brass | 65 |
| Muntz metal | 65 |
| Free-cutting yellow brass | 75 |
| Copper (rolled) | 60 |
| Copper (cast) | 65 |
| Copper-silicon alloys: | |
| Everdur No. 1010 | 55 |
| " " 1012 | 65 |
| " " 1014 | 65 |
| " " 1015 | 55 |
| Duronze I | 50 |
| " II | 55 |
| " III | 65 |
| Herculoy | 55 |
| Gold | 65 |
| Hafnium | 55 |
| Magnesium | 75 |
| Manganese bronze | 55 |
| Nickel-base alloys, wrought and cast: | |
| R monel | 60 |
| Monel (cast) | 55 |
| KR monel | 55 |
| Hastelloy | 55 |
| Illium R | 55 |
| Inconel | 50 |
| Molybdenum | 55 |
| Nickel (commercial, pure) | 50 |
| Nickel Silvers: | |
| 10% to 20% nickel silver | 50 |
| 10% extruded nickel silver | 70 |
| 13% " " " | 60 |
| Silver | 60 |
| Tantalum | 50 |
| Thorium | 55 |
| Titanium | 60 |
| (use C $Cl_4$ or lithopone paste as a lubricant) | |
| Uranium | 50 |
| Zirconium | 60 |

Tables of tap drills for machine-screw sizes were published in earlier RBS (*AM*—Aug 27 '56, p 123). Similar tables for coarse and fine threads from ¼ to 1¼ are given on pages 169 and 171.

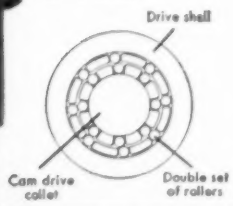
## Stop tap breakage and scrap

# SCULLY-JONES SAFE-TORQUE DRIVERS

### NOW AVAILABLE IN NEW STYLES AND CAPACITIES

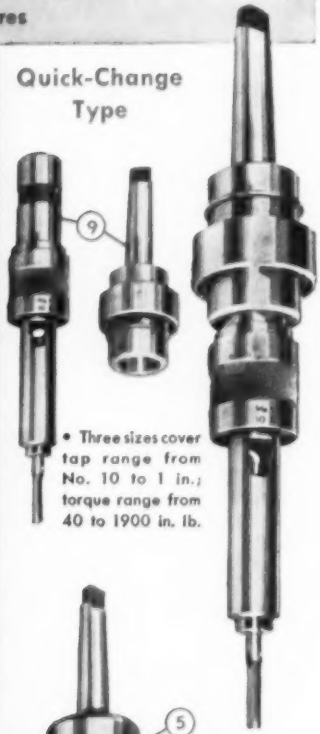
**Heavy-Duty Safe Torque Tap Drivers**

- Two sizes cover tap range from ½ to 1½ in.; torque range from 500 to 2400 in. lb.




| These benefits . . . | for these reasons . . . | result from these PREMIUM features |
|---|---|---|
| PREMIUM TOOL LIFE | Reduce tap breakage. Control adverse tapping conditions, such as dull, soft, improperly sharpened taps, faulty holes, or changes in material. | 1. One-shot clutch and cam-drive collet completely disengage tap from driver when pre-set torque is reached. |
| | | 2. Pre-set torque remains constant. Wide range of torque settings to suit tap and material. |
| PREMIUM QUALITY TAPPED HOLES | Produce uniform, accurate threads. | 3. Freewheeling action when driver releases eliminates impact and objectionable vibration in threads. |
| | Help prevent use of dull or improperly sharpened tap, or wrong tap for the job. | 4. Releases instantly at proper setting, which remains constant. |
| | | 5. Tension and compression type compensates for feed variation between spindle and tap. |
| PREMIUM PRODUCTION EFFICIENCY | Operator gains confidence, more free time for other work. | 6. No noise or impact on release. Tension and compression type spring loaded for cushioned stop. |
| | Use higher speeds on all tapping jobs. | 7. Driver can operate at any speed taps can take, no slow down for blind holes. |
| | Reduce downtime. | 8. Constant torque gives you dependable control over adverse machining conditions. |
| | | 9. Quick-change type permits tool changing without stopping machine. |
| PREMIUM PROFIT OPPORTUNITY | Driver has wide application. | 10. Variety of drivers available to help solve almost any tap breakage problem. |
| | | 11. Torque easily adjusted for variety of materials and tap sizes. |
| | Driver has long service life. | 12. Freewheeling action minimizes wear. |

**Quick-Change Type**




- Three sizes cover tap range from No. 10 to 1 in.; torque range from 40 to 1900 in. lb.

**Tension and Compression Type**

- Two sizes cover tap range from No. 10 to ⅜ in.; torque range from 50 to 700 in. lb.

SCULLY JONES

*Call your Scully-Jones factory-trained representative or distributor for complete information and prices.*

***PRECISION HOLDING TOOLS***

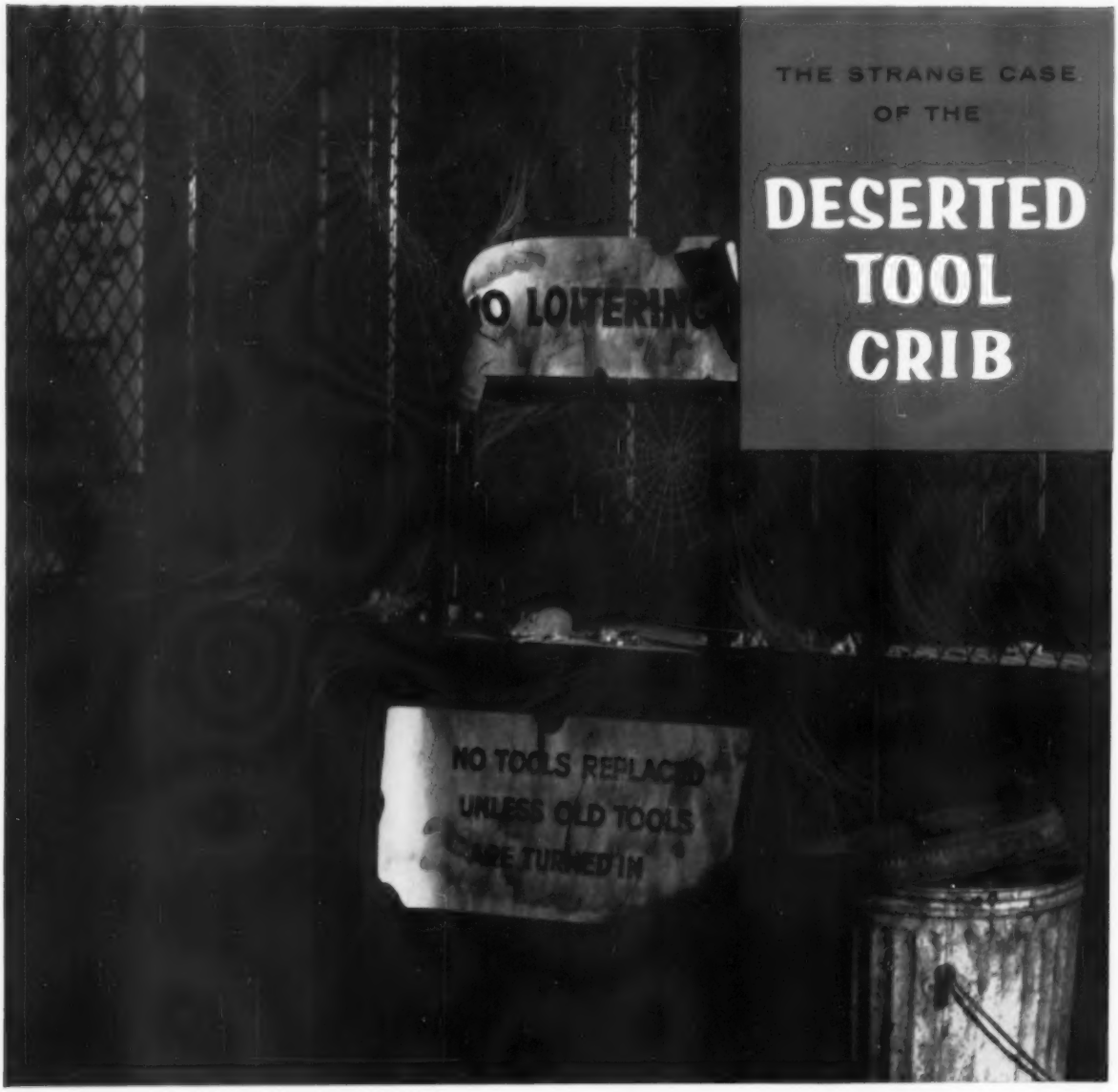
*"Precision Holding" for holding precision*

Scully-Jones and Company, 1902 South Rockwell St., Chicago 8, Ill.

# TAP-DRILL SELECTION . . V

## Coarse- and Fine-Thread Series

| | 83⅓% | 75% | 70% | 65% | 60% | 55% | 50% |
|---|---|---|---|---|---|---|---|
| ¼–20 | .1959<br>9(.1960) | .2012<br>7(.2010) | .2046<br>(.2047)<br>5.20mm<br>6(.2040) | .2078<br>(.2067)<br>5.25mm<br>5(.2055) | .2111<br>4(.2090) | .2143<br>3(.2130) | .2175<br>(.2165)<br>5.50mm |
| ¼–28 | .2113<br>4(.2090) | .2153<br>3(.2130) | .2176<br>(.2165)<br>5.50mm | .2199<br>7/32(.2188) | .2222<br>2(.2210) | .2245<br>(.2244)<br>5.70mm | .2268<br>(.2264)<br>5.75mm<br>1(.2280) |
| 5/16–18 | .2524<br>(.2520)<br>6.40mm<br>¼(.2500) | .2584<br>F(.2570) | .2620<br>G(.2610) | .2656<br>(.2657)<br>6.75mm<br>17/64(.2656) | .2692<br>(.2677)<br>6.80mm<br>H(.2660) | .2728<br>(.2717)<br>6.90mm<br>I(.2720) | .2764<br>(.2756)<br>7.00mm<br>J(.2770) |
| 5/16–24 | .2674<br>(.2677)<br>6.80mm<br>H(.2660) | .2720<br>(.2717)<br>6.90mm<br>I(.2720) | .2747<br>(.2756)<br>7.00mm | .2774<br>J(.2770) | .2801<br>(.2795)<br>7.10mm | .2827<br>(.2835)<br>7.20mm<br>K(.2810) | .2854<br>(.2854)<br>7.25mm |
| ⅜–16 | .3073<br>(.3071)<br>7.80mm | .3142<br>(.3150)<br>8.00mm<br>5/16(.3125) | .3182<br>(.3189)<br>8.10mm<br>O(.3160) | .3223<br>(.3228)<br>8.20mm | .3263<br>(.3268)<br>8.30mm<br>P(.3230) | .3303<br>(.3307)<br>8.40mm<br>21/64(.3281) | .3344<br>(.3346)<br>8.50mm<br>Q(.3320) |
| ⅜–24 | .3299<br>21/64(.3281) | .3345<br>(.3346)<br>8.50mm<br>Q(.3320) | .3372<br>(.3386)<br>8.60mm | .3399<br>R(.3390) | .3426<br>(.3425)<br>8.70mm | .3452<br>(.3445)<br>8.75mm<br>11/32(.3438) | .3479<br>(.3465)<br>8.80mm<br>S(.3480) |
| 7/16–14 | .3602<br>23/64(.3594) | .3680<br>U(.3680) | .3726<br>(.3701)<br>9.40mm | .3772<br>V(.3770) | .3819<br>(.3819)<br>9.70mm | .3865<br>W(.3860) | .3911<br>25/64(.3906) |
| 7/16–20 | .3834<br>(.3819)<br>9.70mm | .3888<br>W(.3860) | .3921<br>25/64(.3906) | .3953<br>(.3937)<br>10.00mm | .3986<br>X(.3970) | .4018 | .4050<br>Y(.4040) |
| ½–13 | .4167<br>(.4134)<br>10.50mm<br>Z(.4130) | .4251<br>27/64(.4219) | .4301 | .4351<br>(.4331)<br>11.00mm | .4401<br>7/16(.4375) | .4450 | .4500<br>(.4528)<br>11.50mm<br>29/64(.4531) |
| ½–20 | .4459 | .4513<br>(.4528)<br>11.50mm | .4546<br>29/64(.4531) | .4578 | .4611 | .4643 | .4675<br>15/32(.4688) |
| 9/16–12 | .4723<br>(.4724)<br>12.00mm | .4814 | .4868<br>31/64(.4844) | .4922<br>(.4921)<br>12.50mm | .4976 | .5030<br>½(.5000) | .5084<br>(.5118)<br>13.00mm |
| 9/16–18 | .5024<br>½(.5000) | .5084 | .5120<br>(.5118)<br>13.00mm | .5156<br>33/64(.5156) | .5192 | .5228 | .5264<br>17/32(.5312) |




Once upon a time there was a large manufacturing company that used so many small production tools that they had to operate two tool cribs. These were the busiest places in the whole shop. High-priced machinists spent so much time lined up to replace high-priced worn-out production tools that the personnel department put the coffee machines near the tool cribs. Then business began to fall off in the tool cribs. No more lines of high-priced machinists. As a matter of fact, one tool crib was all that was needed. Personnel department got worried because the income from the coffee machines was falling off. They decided to find out why one tool crib was deserted.

The answer was quite simple. The production department had started using Copperweld Leaded Alloys. Because of its extreme machinability, tools were just not wearing out the way they had been with unleaded steels. In some cases, tools were lasting as much as 10 times as long. The personnel department moved the coffee machine. The production profits from longer tool life, faster feeds and speeds attained with Copperweld Leaded Alloys, made it one of the most important things that had happened in that plant in years.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY
Steel Division • Warren, Ohio
EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N.Y.

For further details on Copperweld Leaded Alloys, write for free booklet, "Lead Treated Steels."

# TAP-DRILL SELECTION . . VI

## Coarse- and Fine-Thread Series

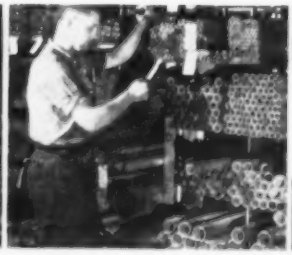
| | 83⅓% | 75% | 70% | 65% | 60% | 55% | 50% |
|---|---|---|---|---|---|---|---|
| $\frac{5}{8}$–11 | .5266 | .5365 (.5315) 13.50mm 17/32 (.5312) | .5424 | .5483 35/64 (.5469) | .5542 (.5512) 14.00mm | .5601 | .5660 9/16 (.5625) |
| $\frac{5}{8}$–18 | .5649 9/16 (.5625) | .5709 (.5709) 14.50mm | .5745 | .5787 37/64 (.5781) | .5817 | .5853 | .5889 (.5906) 15.00mm |
| $\frac{3}{4}$–10 | .6417 41/64 (.6406) | .6526 (.6496) 16.50mm | .6591 21/32 (.6562) | .6656 | .6721 (.6693) 17.00mm 43/64 (.6719) | .6785 | .6850 (.6890) 17.50mm 11/16 (.6875) |
| $\frac{3}{4}$–16 | .6823 | .6892 (.6890) 17.50mm 11/16 (.6875) | .6932 | .6973 | .7013 | .7053 45/64 (.7031) | .7094 (.7087) 18.00mm |
| $\frac{7}{8}$–9 | .7547 3/4 (.7500) | .7668 49/64 (.7656) | .7740 (.7677) 19.50mm | .7812 25/32 (.7812) | .7884 (.7874) 20.00mm | .7956 51/64 (.7969) | .8028 (.8071) 20.50mm |
| $\frac{7}{8}$–14 | .7977 51/64 (.7969) | .8055 | .8101 (.8071) 20.50mm | .8147 13/16 (.8125) | .8194 | .8240 | .8286 (.8268) 21.00mm 53/64 (.8281) |
| 1"–8 | .8647 (.8661) 22.00mm 55/64 (.8594) | .8783 7/8 (.8750) | .8864 (.8858) 22.50mm | .8945 57/64 (.8906) | .9026 | .9107 (.9055) 23.00mm 29/32 (.9062) | .9188 59/64 (.9219) |
| 1"–12 | .9098 29/32 (.9062) | .9188 | .9242 (.9252) 23.50mm 59/64 (.9219) | .9296 | .9350 | .9404 15/16 (.9375) | .9459 (.9449) 24.00mm |
| 1⅛–7 | .9704 31/32 (.9688) | .9859 63/64 (.9844) | .9951 | 1.0044 1.000 | 1.0137 1 1/64 (1.0156) | 1.0229 (1.0236) 26.00mm | 1.0322 1 1/32 (1.0312) |
| 1⅛–12 | 1.0348 1 1/32 (1.0312) | 1.0439 (1.0433) 26.50mm | 1.0493 1 3/64 (1.0469) | 1.0547 | 1.0601 | 1.0655 (1.0630) 27.00mm 1 1/16 (1.0625) | 1.0709 |
| 1¼–7 | 1.0954 1 3/32 (1.0938) | 1.1109 1 7/64 (1.1094) | 1.1201 (1.1220) 28.50mm | 1.1294 1 1/8 (1.1250) | 1.1387 | 1.1479 1 9/64 (1.1406) | 1.1572 1 5/32 (1.1562) |
| 1¼–12 | 1.1598 (1.1614) 29.50mm 1 5/32 (1.1562) | 1.1689 | 1.1743 1 11/64 (1.1719) | 1.1797 | 1.1851 (1.1811) 30.00mm | 1.1905 1 3/16 (1.1875) | 1.1959 (1.2008) 30.50mm |

**NOTE ON PRIORITY RATINGS**—When your stainless requirements are covered by a rating, please be sure to extend it on your order to Ryerson. You will be helping yourself by helping to assure future availability of nickel-bearing stainless from Ryerson stocks. Shown here: One Ryerson plant's stainless sheet section.

# for STAINLESS, call Ryerson...

Ryerson stainless bar stocks include free-cutting types, aircraft quality bars—many others.

Any shape can be accurately flame cut from stainless plate with special Ryerson plate burning equipment.



More than 300 miles of stainless pipe and tubing are on hand at Ryerson. Size range: ⅛" through 8⅝" O.D.

Felt pads on Ryerson shears protect the beautiful finish and flatness of Allegheny stainless sheets during cutting.

## here's why:

your call to Ryerson connects you with the nation's largest stocks of stainless steel—2,351 sizes, shapes, types and finishes of time-tested Allegheny stainless—carried in tonnages that assure prompt shipment of your warehouse requirements.

. . . you get the benefit of Ryerson's long experience with stainless—30 years of it, dating from the days when Ryerson pioneered as the first supplier of stainless from stock. All we've learned in that time is at your command when you want help on problems of stainless application or fabrication.

## RYERSON STEEL

PRINCIPAL PRODUCTS: CARBON, ALLOY AND STAINLESS STEELS • MACHINERY & TOOLS • INDUSTRIAL PLASTICS, ETC.

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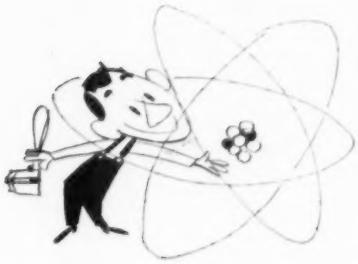
# Talking Shop . . .



### Sciengineer?

"THE MODERN ENGINEER must become more of a scientist, and the modern scientist is being forced to become more of an engineer," said Dr Donald H. Loughridge, GM staff scientist, recently. He believes the distinctions between scientist and engineer are rapidly being obliterated. In some senses, this is good; in others, it is not. We have now as a nation, begun to appreciate the importance of basic research (which we before WW II got from Europe or from universities), but we must make provision for some basic research in every program, not stick strictly to the engineering research that produces "hardware"—military or civilian.

### Better Air

A RECENT SURVEY indicates that 75% of new factories—and 50% of all factories—in the South will be air-conditioned by 1960, and 90% by 1970. This is heavily for employee comfort. The trend is also spreading in the North, particularly in factories involving high skills, such as the electronics industry, according to The Trane Company, La Crosse, Wisconsin.

### Erector Set

THE AIRCRAFT INDUSTRY has turned to a child's erector set to reduce costs and speed production of control instruments. This unique kit consists of various-sized sheets of perforated fiberboard, an assortment of angle brackets, binding posts, stand-off legs, clamps, wings and hex nuts, perforated metal sheets and strips, bolts and other fixtures. It is used to build wiring and temporary inspection fixtures, electrical testing panels, wiring "mockup" boards and other assembly fixtures to meet short-run production requirements.

As examples, the cost of a $360 cementing fixture was cut to less than $100; an aluminum holding fixture that might have cost $100 was built for only $15.

### Double Cash

CONVAIR has revised its cost-improvement program to double awards for suggestions. Hereafter, awards will be 10% of dollar net savings in one year, plus added awards if the idea is used by more than one division. Minimum award is $10, max $10,000. During the first six months, 5800 suggestions were received; 1648 won cash. Total savings were $638,451. Highest award was $784 for a way to buy wing skins cheaper.

### Better, Not Worse, Men

AUTOMATION, contrary to popular opinion, requires better workers—men who can reason, who know what to do when the machine does not. Thus, anticipate not only a shortage of men, but a more vital shortage of good and skilled men for shop personnel. Unskilled workers have declined from 36% of the labor force in 1910 to 18.6% last year, and further drops are expected, to 16.8% in 1960, and 15.1% in 1970. Semi-skilled, meanwhile, have increased from 14.7 to 23.2%, are expected to advance fractionally; skilled labor and foremen have gone from 11.7% to 13.7%, will rise above 14%. But clerks have about doubled—from 10.2 to 19.0%, are expected to go over 21%. (There's your overhead coming in!) Only about a million more people were in manufacturing last year than in 1910, but in service industries the figure had gone from 14 million to almost 30 million. *There are now more people in service industries than there are in manufacturing.* Further, there are over twice as many professional people (9.1% vs 4.4%) and a marked decline in self-owned businesses (16.4% vs 23%).

### File Trick

THAT TRICK of acid "resharpening" of worn files is now reported from the Straconice Motorcycle Factory in Czechoslovakia, where they claim a 50% increase in service life. They say it is a "general overhaul" rather than a "general renewing," as we translate it (the file isn't "as good as new," but it is chip-free and clean). Anyway, the process consists of six steps:

1. Degrease in tri-chlorethylene vapor
2. Dip 5 min in 50% $HNO_2$ at 20C
3. Rinse in cold running water
4. Dip 3 min in 10% concentrated $H_2SO_4$, 10% concentrated $HNO_3$ and 80% water at 20C
5. Rinse in cold running water, neutralize in hot 10% soda solution, rinse in hot water again, and dry in hot-air blast
6. Dip in bearing oil "L" at 20C to prevent rusting

Step 4 is reported to create turbulence and foam in the solution and form considerable amounts of free hydrogen. To take off the oil in step 6 before the file is used, degrease the file again (as in step 1) in tri-chlorethylene vapor.

### Bending Ceramics

UNIVERSITY OF CALIFORNIA suggests the possibility of ceramic materials that will bend. Prof Earl R Parker there says he has tried ionic solids—salts that are hard and brittle like ceramics. (The actual one was potassium chloride, which is ductile like common table salt but easier to handle.) They became ductile after 3-sec immersion in water. Ice also could be made ductile by using a solution of Aerosol AT, a special wetting agent, and isopentane. The trick now is to find a solution that will do the same thing to ceramics. A bendable ceramic would solve a lot of heat-protection problems in aircraft, but wouldn't be much help in a cutting bit.

# U S Tool Replacement Program Slows

## Inter-Pentagon Hassle May Mean Too Little, Too Late

**WASHINGTON—The Defense Dept's highly-touted program to replace and modernize its $2.9 billion worth of machine tool holdings—originally disclosed in January—will not begin before July 1957.**

This is made clear in a proposed Pentagon directive setting forth tool replacement and modernization policy. And from private statements of Defense Dept and Office of Defense Mobilization officials, it seems unlikely the program will go as far as the machine tool industry has been led to believe.

The proposed directive, which has been in the works for almost six months, now states that "effective with the preparation of fiscal year 1958 budget estimates, provision will be made for funds to provide replacements for machine tools in the custody of the military departments."

A top-level Pentagon budget official says the decision on the amount to be earmarked for the program will not be made before November. He also implies that the sum will be considerably below the amount sought by mobilization planners.

### Pentagon Family Quarrel

His remarks point up a Pentagon controversy over the program, which has held up release of the proposed directive. The conflict is between the offices of Assistant Defense Secretary W J McNeil, the Pentagon comptroller, and the Assistant Secretary of Defense for Supply and Logistics—a post now temporarily held by Robert C Lanphier, Jr.

The Supply and Logistics Office, which coordinates the Defense Dept's industrial mobilization plans, has drafted the proposed tool directive "to insure that an active replacement program in connection with machine tools is purchased by Department of Defense agencies."

### What the Directive Says

These are excerpts from the proposed directive:

- **OBJECTIVE:** "Maintenance of military machine tool stocks in a modern condition and a program leading to subsequent development of a uniform Department of Defense replacement program."
- **POLICY:** "To guard against obsolescence of military industrial, maintenance, overhaul, repair, and service establishments, machine tools will be replaced as set forth herein to promote efficiency, economy, productivity, or industrial mobilization requirements."
- **PROCEDURE:** ". . . A total annual requirement approximating 2% to 5% of the acquisition cost of machine tools listed in the departmental inventories . . . is considered to be reasonable. Requests for amounts less than or exceeding this figure, will be submitted to the Assistant Secretary for Suppy and Logistics for review together with substantiating data which in cases of more than 5% will include quantities, condition, and ages of machines being replaced, and whether these are in use, standby plants, general reserve or other status. Funds for annual increments of this program will be separate and specifically identified within regular appropriation requests. Funds appropriated for these purposes will not be reprogrammed to other uses, except when such action has been cleared with the comptroller. The selection of machines to be in the quota for which replacement will be requested will be accomplished through existing replacement programs or procedures . . . initial replacements will be made for machine tools in current operations."

### Date Is Uncertain

At this point, it is still uncertain when—if at all—the directive will be officially issued. It is understood that ODM, which has actively supported the proposed program, plans to ask Defense Secretary Charles E Wilson to resolve the Pentagon controversy and get the plan under way.

One Defense Dept official close to Wilson says that only tools in use will be replaced, and that the military will not be allowed to "replenish 5%" of its tool inventories.

### More Foot Dragging?

In its machine tool report this spring, the Senate Small Business Committee criticized the Pentagon for dragging its feet on the tool replacement and modernization program and recommended that the proposed 2-5% replacement plan be increased. Said the Committee: "Progressive industry uses an annual depreciation rate of 8-15% to maintain efficient tools." By this standard, said the Committee, the Pentagon's plans are "unrealistic."

Actually, the Air Force and Navy placed heavy orders for tool replacement and modernization projects in fiscal 1956 just ended. The Air Force awarded about $70 million worth of contracts using funds originally appropriated for the ill-fated Vance Plan for machine tool stockpiling. An Air Force official says there was no time to "set much of a program for fiscal year 1957," but that "something" may be available this year.

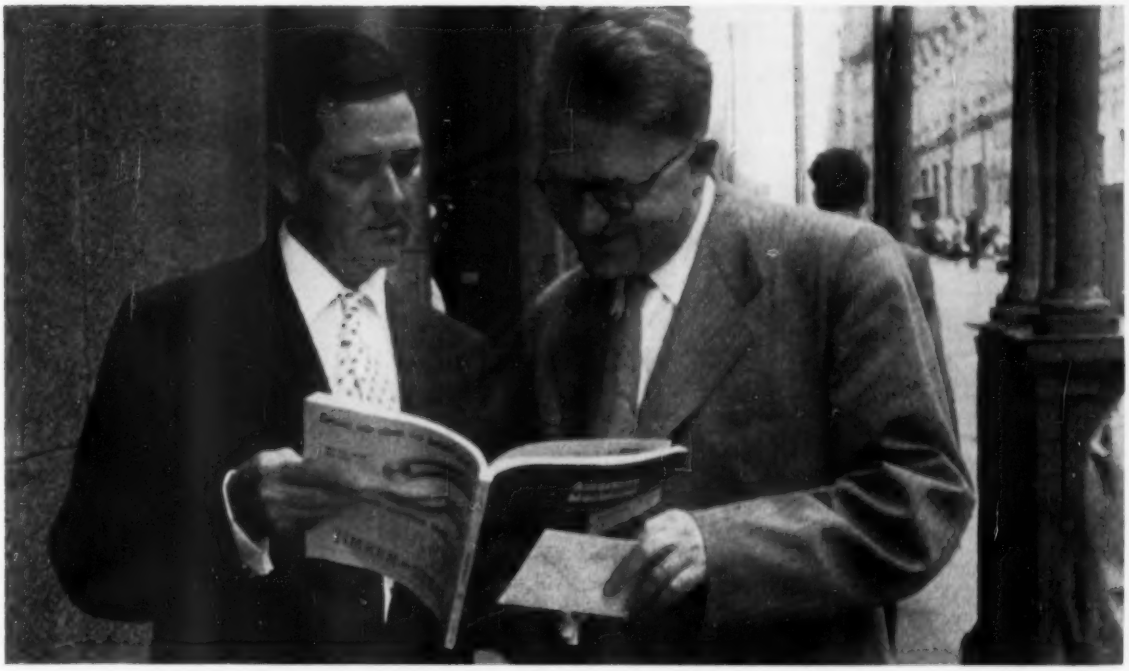
### Navy OK'd, Air Force Waits

The Navy finally got authority last month to buy $3.5 million worth of tools to replace equipment in active production lines. There was a big hitch in the Navy's project: bids were sought from machine tool builders months before it was certain the Navy would receive Budget Bureau authority to place the orders. This was the first military tool procurement based on a formal replacement formula—a modification of MAPI's.

While awaiting the okay to get its new tool replacement program off the ground, the Air Force has set plans for stripping its inventory of obsolete and worn out tools, replacement in inventory of tools for which more advanced types exist, and repair of older tools if economically feasible.

## W&S to Enlarge Tool Capacity 25%

CLEVELAND—Warner & Swasey Co will spend $2.8 million to expand its machine tool manufacturing space and to acquire new machines and equipment, according to a recent announcement by W & S President Walter K Bailey. The company expects to complete its expansion sometime late in 1957, increasing its machine tool manufacturing capacity by about 25%. Cost of the proposed expansion program will be met from the proceeds of a recent issue of common stock, totaling nearly $4 million.



## Soviet Official Reads American Machinist Story

**IN FRONT OF MOSCOW'S SAVOY HOTEL,** Alexi I Grechukin, Russia's Deputy Minister of Machine Tools and Small Tools, delightedly looks over American Machinist's report of an exclusive interview by Editor Burnham Finney with A I Kostousov, Minister of Machine Tools and Small Tools, in London recently (AM July 16/56 p162). The copy was delivered to Mr Grechukin by Shelton Fisher (left), publisher of McGraw-Hill's *Power*, who has just returned from a tour of Russian power and industrial plants. Said English-speaking Deputy Minister Grechukin, "I am very pleased with your report of the interview, and I am sure Mr Kostousov will be, too. We both enjoyed talking with Mr Finney in London very much . . . we are extremely interested in American technical publications."

# FTC Launches Anti-Merger Drive

**WASHINGTON — America's biggest truck trailer manufacturer, Fruehauf Trailer Co, is the first firm to feel the effects of the Federal Trade Commission's new anti-corporate-merger drive. In a three-pronged attack, the FTC charged Fruehauf with:**

- Unfair competition and violation of the Federal Trades Commission Act by buying up rival firms.
- Committing such unfair business practices as the financing of trailer sales on terms that competitors couldn't possibly match.
- Acquisition of five rival companies in five years—a clear violation of the anti-merger law. The companies: Carter Mfg Co Inc, Memphis (aluminum van trailers), acquired in 1947; Brown Equipment & Mfg Co, Westfield, Conn (aluminum trailers) 1943; Hobbs Mfg Co, Fort Worth, Texas (aluminum trailers and dump trucks) 1955; Strick Plastic Corp, Perkasie, Pa (third largest U S truck trailer maker) 1956; and Independent Metal Products Co, Omaha (maker of tank shells for oil, gas and milk trucks) 1956.

The Commission charges that even before it began purchase of the five companies, Fruehauf was the dominant factor in U S truck-trailer manufacturing, sales and service. Now, says the FTC, Fruehauf and its new acquisitions are well on their way to creating a monopoly.

As an example, FTC charges the addition of the five firms to Fruehauf will boost Fruehauf's share of the national market from 37% to almost 49%. Combined sales reached a total of more than $181 million in 1955, out of an all-industry total of $372 million.

And, says FTC, acquisition of Brown & Strick by Fruehauf ups Fruehauf's share of the new aluminum van trailer market from 30.5% to nearly 51%. Purchase of the Hobbs facilities has upped Fruehauf's share of the dump-trailer market from 27% to more than 46%.

In attacking Fruehauf's financing practices, FTC is taking its cue from last July's Justice Dept suit charging General Motors with a bus monopoly. Then, antitrusters claimed GM used its tremendous bankroll to offer financing terms no competitor could meet.

FTC is leveling a similar charge at Fruehauf, on grounds that it is using its wholly owned Fruehauf Finance Co to beat down competitors' terms.

An example: in one deal, Fruehauf furnished more than $8 million in new equipment to an unidentified buyer on a seven-year finance plan on terms that actually meant Fruehauf had to advance the buyer some $2.5 million. The buyer's down-payment on the new trailers was subtracted from $3 million Fruehauf agreed to pay the buyer as a trade-in for his used trailers.

## New Frontiers In Basic Research Studied by RIAS

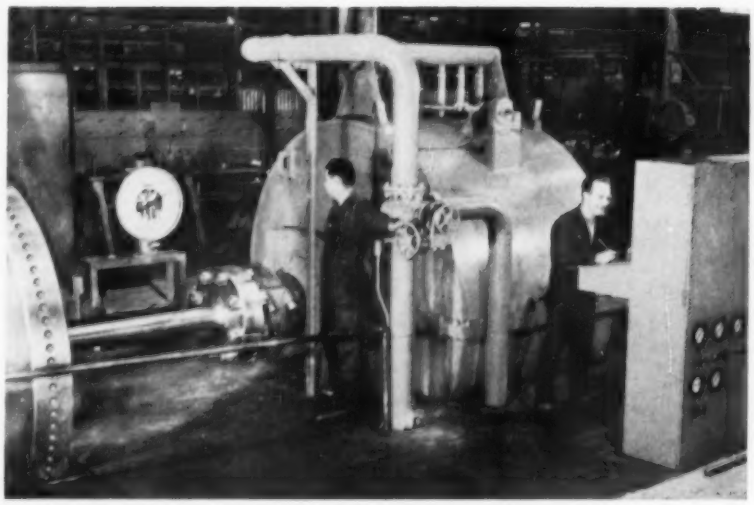
BALTIMORE — Fundamental research in an industrial atmosphere is the aim of Martin Co's new subsidiary, RIAS Inc. Staffed with a select group of scientists who are being encouraged to create their own program of research aimed at the frontiers of man's knowledge, RIAS is setting up a program of theoretical and experimental studies that will in no way be tied into Martin product development or its production-line problems.

Contemplated studies include the scientific areas that might be involved in space travel, atomic and sub-atomic physics, fluid dynamics, materials in their solid state, and the fundamental structure of metals. Ultimately, much of this basic research at RIAS will benefit the metalworking industries.

Projects will develop in a number of ways. RIAS will hire outstanding scientific talent with the understanding that these people are free to follow their own pursuits. Others will be hired to study specific problems, and scientists who need funds to further an idea may, if accepted, receive an income and use of the facilities of RIAS to work it out. The purpose of RIAS, according to its VP Welcome W Bender, is to foster basic research and research talent in the belief that they are a major U S national resource and should be nourished by industry in an atmosphere uncomplicated by profit motives.

## Numerical Control Development Firm Formed in Boston

BOSTON—Expanded applications of numerical control to manufacturing processes are the goal of Concord Control Inc, newly formed here by engineers and researchers who have been associated with the Air Force and with development of the first numerically controlled milling machine at MIT's Servomechanisms Laboratory. Fully equipped to develop numerical control systems, Concord is already among the first to produce numerical control systems for the fully automatic machining of aircraft components.



## West's Biggest Dynamometer

**READY TO TEST THE DIESEL ENGINE OF THE FUTURE** is this 90,000-lb, 10,000-hp hydraulic dynamometer built at a cost of $250,000 by Enterprise Engine & Machinery Co, San Francisco, to test its 7000-hp series RW diesels

## Boom Is Here to Stay, Budget Bureau Says—But There Are Hitches

**WASHINGTON—The business outlook for Metalworking—and all business—gets a mixture of good news and bad from the administration's own latest assessment of federal taxing and spending for the year ending next June 30. The estimate shows income of $69.8 billion, balanced against an outgo of $69.1 billion. On the good side:**

- Corporate profits are still figured to stay as high this year as was estimated eight months back. The business boom will remain.
- Some segments of the economy will get a new shot in the arm from increases in government spending. Farm programs, for instance, will get about $2.4 billion more this fiscal year than the government experts figured some months back.
- Department of Defense spending will run some $435 million higher than was expected in January.

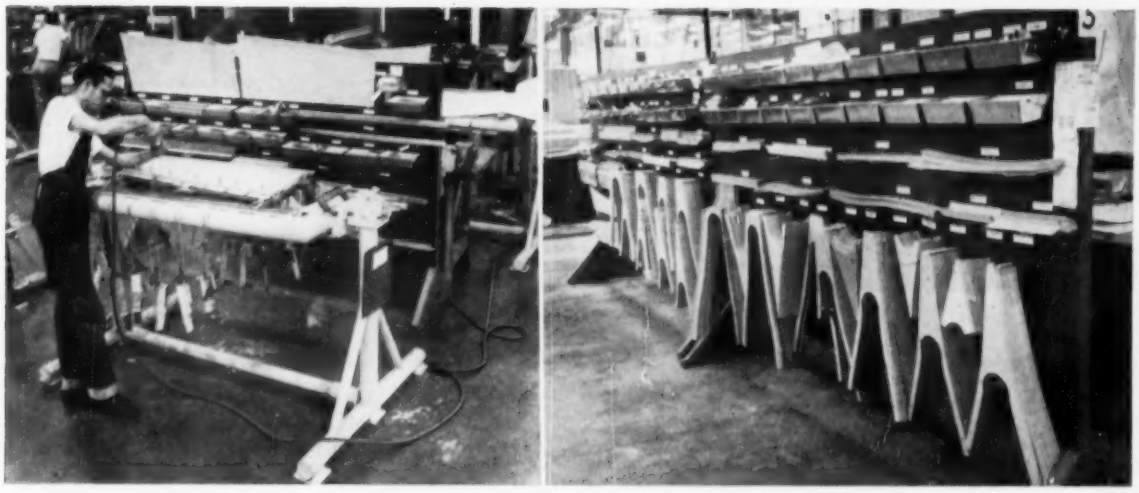
On the other side of the picture, as painted by the new report from the Bureau of the Budget:

- The rise in government spending (some $4 billion more than was expected in January) almost offsets the increased tax revenue brought in by the big business boom and expanding personal incomes. Result: an estimated budget surplus of only $700 million—far short of the $3 billion Treasury Secretary George Humphrey has said is the minimum needed to justify a tax cut.

According to the official budget estimate, total military spending for the current fiscal year will be some $314 million higher than for the year that ended June 30. But privately, budget experts expect the hike to be at least twice as high. The new estimate shows a $562-million decline in hard goods spending ("major procurement" of aircraft, ships, vehicles, missiles and the like. Here, too, officials privately expect a bigger expenditure figure—close to the $12.3 billion in 1956.

The new "product mix" of Defense Dept spending items shows that military pay totals will stay about the same as last year; military construction spending will be off slightly. But funds programmed for research and development.

Spending on new weapons—guided missiles, advanced aircraft and the like—will rise, while spending for conventional ammunition, vehicles and weapons will continue to fall off. The rising complexity of military equipment shows up in the higher costs to the military of maintenance and operation—an increase of almost $500 million over maintenance and operating costs in fiscal 1956.



## Peg Panels, Hook Fittings Cut Storage Space 35%

**REDUCTION OF STORAGE SPACE** for irregularly shaped parts in assembly areas has been achieved at Rohr Aircraft Corp, Chula Vista, Calif, with peg panels and hook fittings. Both standard hooks and "made" hooks for irregular sizes and shapes are used. Conventional parts storage bins are eliminated through use of peg panels mounted on casters that (1) permit removal of a depleted panel for restocking without interfering with assembly work, and (2) allow movement of peg panel parts storage units directly to the assembly area. Another advantage: assemblers have a clear view of parts at all times, thus avoid confusion and time-consuming searches

# Steel Opens the Door To Fast Writeoffs

WASHINGTON — Industry's hopes for a new breakthrough on fast tax amortization out of Washington are getting a new lift—but at the moment it appears that if any new program is to be approved it'll be the steel industry that gets the benefits.

Steel leaders have been working on their campaign for a year or more —but it was only after the steel settlement and the subsequent price increase on steel that the steelmen were able to make any headway.

The Defense Mobilization Board has met to look over proposals from lower government officials that are aimed at reopening expansion goals for a variety of steel products—structurals, plates, tubular forms, to name a few. Such meetings are evidence that the government is reacting to widespread contention in the industry that the cost of the new wage contract cannot be offset by announced price increases and still leave money in the till to finance new expansion.

Other metal production goals are being reconsidered also. Titanium, tungsten, manganese, and columbium-tantalum are examples. Nickel's goal already has been boosted 50%. A decision on new incentives for metals other than steel, however, is not as close.

The government is ready to give steel producers new tax help as an incentive to expand capacity for certain types of steel—but only with definite strings tied to the offer.

The administration's top defense chiefs, in principle, favor reopening expansion goals for structural and tubular steel forms, and to boost the present goal for heavy plate. Defense officials won't hold up setting any specific new goals, however, until they can meet informally with steel producers to get assurances on three points:

- That the new fast tax writeoff help would be used only on production facilities for specific shapes, forms and sizes now in tight supply;
- How much of these types of steel industry would be willing to turn out for how much tax help; and
- How much tax help industry would need to be persuaded to disperse its new facilities.

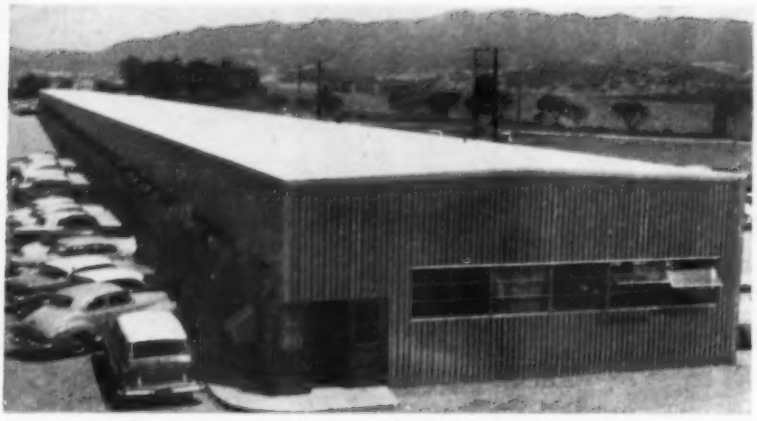
Pressures for reopening expansion goals have become increasingly strong recently—particularly from hard-pressed smaller users, whose complaints often get the most sympathetic attention on Capitol Hill and in the administration itself, especially in an election year.

Business & Defense Services Administration has recommended reopening of production-capacity goals for short types of steel. And Commerce Secretary Weeks, who himself has not been a strong advocate of reopening the goals, is turning around now in his viewpoint and is a leader in the movement to convince Treasury Secretary Humphrey of their necessity.

BDSA sees the new goals as the only alternative to allocation controls. While the White House has the standby authority to use this solution, it is an unpopular one at best, particularly this year. On the other hand, commerce sees a growing and steady need for the short types for some time to come—both in military and essential civilian operations.

Before granting tax amortization for new facilities, steel producers will have to agree to turn out needed types before the tax help is granted. Then the administration will try to find out how much new production will result from different writeoff percentages—60%, 70%, 100%—before settling how much help will be finally given.

**Unorthodox ideas . . .**
are 37-year-old Frank Talley's strong point. At one time he paid his top turret lathe operators up to $1200 a month. Then he pulled an abrupt about-face, moved his company into the heart of unskilled-labor country. That's why the West Coast is buzzing about this . . .



**Straightline flow—and no backtracking . . .**
is one governing idea of Frank Talley. Another is to isolate departments so that none is disturbed by performance—or the lack of it—in another. The result is this plant, 40 ft wide and already 800 ft long. It will go next year to twice the length to allow for increased production, plating and heat-treating departments. In half the plant complete separation just isn't possible but the basic idea is followed, grouping two or three departments together

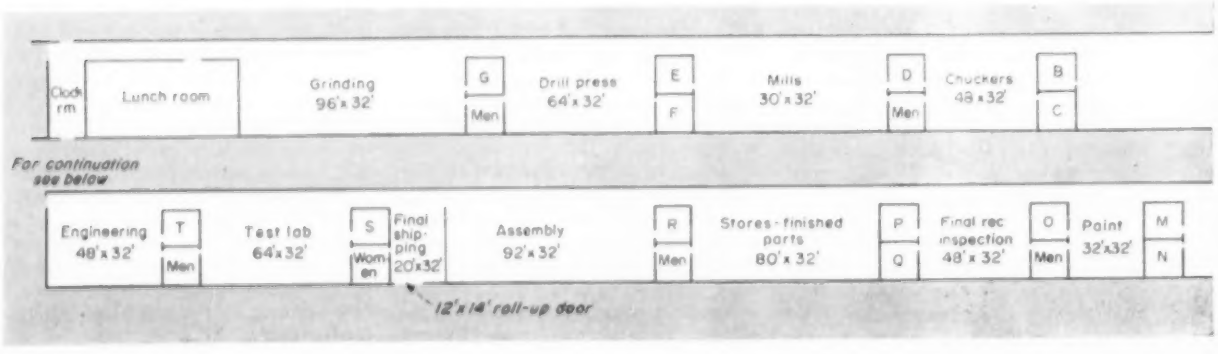
## Young man with an . . .

# Offbeat Operation—"Green Men and

NEWBURY PARK, CALIF—Frank H Talley, who during the Korean crisis made history in Los Angeles by paying skilled turret-lathe operators as much as $1200 a month in wages and bonuses, has pulled a switch. Talley Corp moved to this town in the middle of the Ventura County walnut-growing area in May, now is using apprentice labor to turn out complex aircraft components, to tolerances as close as 0.0002 in. This area is primarily agricultural (50 miles from Los Angeles), so most available workers have never been inside a machine shop.

Reasons? As the Korean War ended, Talley switched from a job shop to a company designing and making such proprietary items as electro-mechanical actuators, and hot-air valves. The extremely high wages dropped, but Talley still paid at the top, $2.82 for grinders and turret-lathe operators, plus profit sharing. But even such top pay didn't build a stable labor force in a man-hungry area. Too many skilled machinists began to think: "How much am I making? How much more can I make somewhere else? How little work can I get away with?" This in spite of a bonus arrangement (still in effect) that works like this: Each four-month period, a standard 18% future investment and reserves is taken from gross billings; the rest is divided 60% for employees, 40% to the company, employee shares be-

**BELOW:**
**Building costs were $3.25/sq ft . . .**
for Talley Corp's structure, diagrammed below. This includes plumbing but not electrical wiring. Construction is steel frame with steel roof decking and wall panels with window inserts. Wall panels are demountable. Ultimate building length is 100 bays, each 16 ft long by 32 ft wide (plus an 8-ft corridor), and plus two 2-ft expansion joints for a total plant length of 1604 ft. Only the upper half is now done. The site is 14 acres



**Only interdepartmental connection . . .**

is this 8-ft corridor along one side of the plant. Departments are divided by restroom and toolroom so noise, etc, is confined. Stock and parts are kept out of work areas except when worked, are trucked down the aisle. Noise reduction is notable, and the turret-lathe setup has worked very well. Cost is about 25% over that of a square plant because of added wall and window footage, but expansion of a single department is easy—you just move out the wall opposite the corridor

# Room to Stretch"

ing pro-rated according to their earnings during the period.

So Talley moved—to improve labor quality and attitude. Most of the skilled labor would be lost, but Talley figured that was desirable as well as inevitable. Some 95% of the shop personnel stayed in town. The skilled men who came along are now supervisors at $2.40 an hour. And there's a supervisor for every two or three new men (one for every two in grinding). He sets up the job and watches performance. The new men get $1.30 an hour—equal to or better than their pay as a ranch worker or the like—because living costs are lower here. The three new men, plus one supervisor, cost less than three $2.40 men. And if the new men work out, they get a 5¢-an-hour raise each month for 6 months, bringing them to the "C" (Specialist) rating at $1.60 per hour. Now the unit costs as much as three skilled men, so the ratio is dropped to one supervisor for each four men.

After 6 months, Talley expects a "C" man to be able to make a few simple setups and to use a micrometer, an air gage, or other simple instruments. Thereafter, his wage rate will be reviewed every 6 months. This system isn't new—Talley tried it for two years in Los Angeles on a limited basis. It worked there, and here even better. Production rate within two months was up to or better than the old rate with skilled men.

Frank H Talley, now 37, founded Talley Corp in 1947 with the proceeds of sale of a predecessor to Morehouse Industries. He first handled subcontracts for farm-implement and oil-field equipment makers, then moved into aircraft subcontracting in 1949. Now, proprietary items account for about 94% of the $2.5-million annual business volume, the rest mostly in aircraft subcontracting. Employment currently is 200 (150 production people), with a goal twice that in a couple of years.

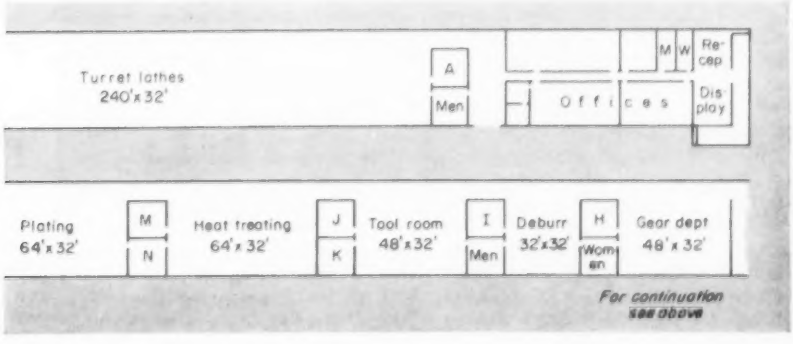
### Home-Grown Talent

Talley believes that starting new people in with the company will tend to hold them to it. Also that people working near home will work extra hard, and make up for their lack of experience with extra effort. He's also added another trick: breaking a job into "one-shot deals." One aluminum housing casting for an actuator, for example, is machined by 22 different men, one doing a boring job, another milling a pad, and so on. If a job causes trouble, it is broken into smaller parts. There is much special fixturing, some of it to transfer lathe or borer jobs to drillpress, for example, to reduce required skill. The fixture sets the tolerance. In one typical case, a difficult grinding job, always assigned to the best grinder hand in the old plant, here was given to an apprentice. "He didn't know enough to be scared of it," says Talley. "He had no inhibitions—just went ahead and tried it. And he's been doing an excellent job." Talley Corp does all its own grinding, in contrast to many shops in LA, which farm grinding out to specialists.

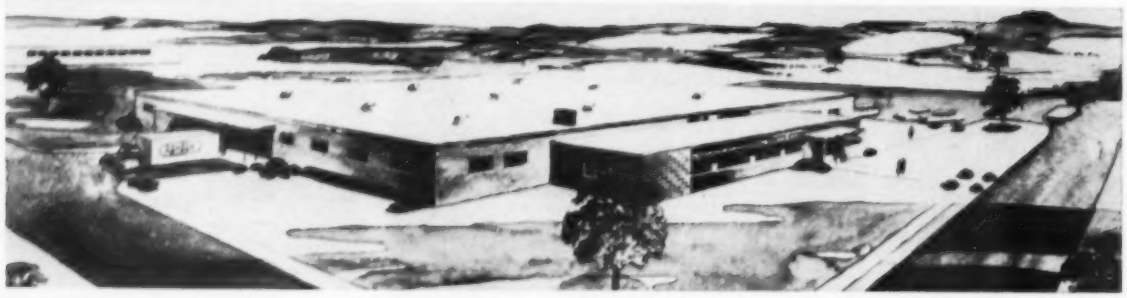
### First Olive Out of the Bottle?

Talley doesn't figure this move will solve all company problems. He assumes other industry will come in soon. He expects competition for good people, but nothing like LA turnover, where "as soon as you taught a man to throw a switch, he was ready to move on."

Straight-line flow is carried to its ultimate in this plant, to achieve efficiency and to isolate departments. For how this works, check the pictures on these pages.



# FIELD REPORT



**CHARLOTTE, N C:** This is what Ronson Corp's (the lighter people) proposed 21,000-sq-ft plant will look like when it's finished here sometime next summer. The new plant will produce hydraulic valves and cylinder assemblies for aircraft and guided missiles rather than Ronson's line of pocket lighters

## South...

### Around the South . . .

**General Electric** will build a $2-million plant in Murfreesboro, Tenn, for production of motors for washing machines and home appliances. Plans call for a 135,000-sq-ft building, about 500 employees when capacity production is reached . . . During the first six months of this year 126 new manufacturing industries representing capital investment of $137 million were established in Georgia as against 68 new firms, $7 million investment in the same period of 1955 . . . **Temco Aircraft Corp** has received new orders from McDonnell Aircraft Corp for manufacture of additional F3H Demon fighter wings and aft fuselages. Production will be handled at Temco's Dallas and Garland, Texas, plants . . . **Ford Motor's** expansion program will just about double capacity and size of its Atlanta plant; capacity will be 640 units per day . . . **GM's Chevrolet Division** is building a multi-million dollar 500,000-sq-ft parts warehouse near its Doraville, Ga, plant . . . **Monroe Auto Parts Co's** new $2-million plant at Hartwell, Ga, has begun manufacture of shock absorbers for passenger cars . . . Construction will be started soon by **Johns-Manville Corp** on a Transite asbestos-cement pipe plant at Denison, Texas. Second J-M facility in the state, it'll employ 270 people in a 350,000-sq-ft plant on a 400-acre tract of land . . . Manufacture of electronic-mechanical equipment has started at **O E Szekeley & Associates'** new plant in Commerce, Ga . . . **Armco Drainage & Metal Products** plans immediate construction of a new $500,000 plant in Atlanta for production of gasoline and fuel oil bulk storage tanks, corrugated metal pipe, and other products.

## West...

### Western notes . . .

**North American Aviation's** Fresno and Los Angeles divisions have Air Force contracts for modification of F-86D Sabre jets; ultimate amount will top $20 million—work to run until November 1957 . . . **Litton Industries,** Los Angeles, is taking over **Triad Transformer Corp** there, and its Indiana subsidiary, **Utrad Corp,** leading producers of transformers and other electronic components . . . **National Tapered Wings, Inc,** Los Angeles manufacturer of airframe and missile structural members, is starting construction on a 100,000-sq-ft factory and office building in Anaheim, Calif . . . **Daystrom Pacific Corp,** Santa Monica, will break ground soon on a $500,000 office-research-manufacturing facility in the Westchester area of metropolitan Los Angeles for relocation and expansion of company headquarters, plus the firm's **American Gyro Division** . . . **Diamond Manufacturing Co** of Wyoming, Penna, has a new affiliate, **Diamond Perforated Metals,** in Gardena, Calif. Company says it has the first major perforating plant for complete commercial production on the West Coast . . . **Lockheed Aircraft's** backlog increased 31% in the past year to a peacetime high of $1,390,-648,000 . . . Electronic tape-controlled milling machine, incorporating **Electronic Control Systems'** Digimatic, was demonstrated at the Western Electronic Show and Convention, Los Angeles. Company estimates that addition of the system to machine tools can result in 50% higher output than present conventional control methods . . . New plants and expansions in the **San Francisco Bay** region are 76% ahead of 1955. More than $166.5 million was pledged throughout the 13 counties during the first five months, $8,645,500 during the month of May . . . New orders topping $576 million have been received by **Boeing Airplane** for B-52 Stratofortress long-range jet bombers, spare parts, and engineering data. Contracts to be handled by the Seattle, Wash, and Wichita, Kans, plants, increase Boeing's backlog to more than $3 billion.

## East...

### Eastern newsbriefs . . .

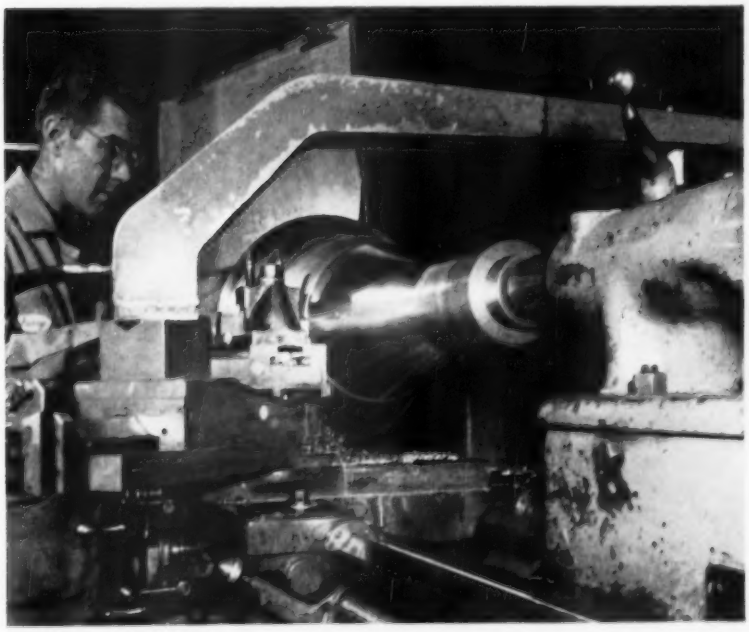
**US Industries, Inc,** has acquired the assets of **Western Design & Manufacturing Corp,** Goleta, Calif, firm specializing in engineering and manufacturing of components and systems for supersonic aircraft and missiles. Company will operate as a US Industries' division . . . **Vanadium-Alloys Steel Co** is expanding its Latrobe, Penna, mill, doubling capacity for production of high speed steel; new facilities are scheduled to be in operation in 15 months . . . **General Electric Co** is speeding plans for expanding and modernizing its small steam turbine department at Fitchburg, Mass; $3 million has been earmarked for the project . . . **Stevens Institute,** Hoboken, NJ, is offering a course (new this year) in graduate work leading to a Master of Science degree in computers; classes will be held in the evening . . . **Lewyt Manufacturing Corp,** Long Island City, has been awarded a $567,000 Air Force contract for a transistorized indicator that accepts and displays remote radar data and prints selected information on tape for a permanent record . . . **Ajax Flexible Coupling Co,** Westfield, NY, is constructing an addition to its plant; production will be doubled in early November . . . **Shallway Corp** and **Shalco Engineering Corp,** Palo Alto, Calif, foundry equipment man-

ufacturer, have consolidated. Eastern sales and service headquarters will be at the Shalco Demonstration Center in Connellsville, Penna . . . **Piasecki Aircraft Corp**, Philadelphia, has been awarded a $58,000 Army contract to prepare designs for large "flying cranes" to lift 16 tons of cargo to five times capacity of present helicopters . . . **Victory Metal Manufacturing Co**, commercial refrigeration manufacturer, will build an 80,000-sq-ft addition to its two-year-old plant at Plymouth Meeting, Penna . . . **Machine & Metal Evening Trade School**, New York, is offering a free course in foundry practice designed for people who must have practical knowledge of how a sand casting is made; registration, Sept 10 and 11; educational requirements, none at all . . . **Circo Equipment Co**, Rahway, NJ has formed the **Circo Cleaning & Finishing Equipment Corp** as a subsidiary to meet demand for metal parts washers, dryers, and complete finishing systems . . . **Bethlehem Steel Co**, and **Armco Steel Corp**, Baltimore producers, report they are moving toward "normal output" following the recent nationwide strike. Heavy demands, however, may call for huge production boosts . . . **Bethlehem-Sparrows Point Shipyard**, Baltimore, may yet build three large super-tankers for the Military Sea Transportation Service. Congress provided for construction two years ago, accuses MSTS of "fumbling" since then in inviting, then rejecting bids; new invitations have now been offered . . . **Florence Stove Co** will close its Gardner, Mass, plant as soon as current contracts for manufacture of airplane component parts are completed, sometime between November and March. Plant employs about 500.

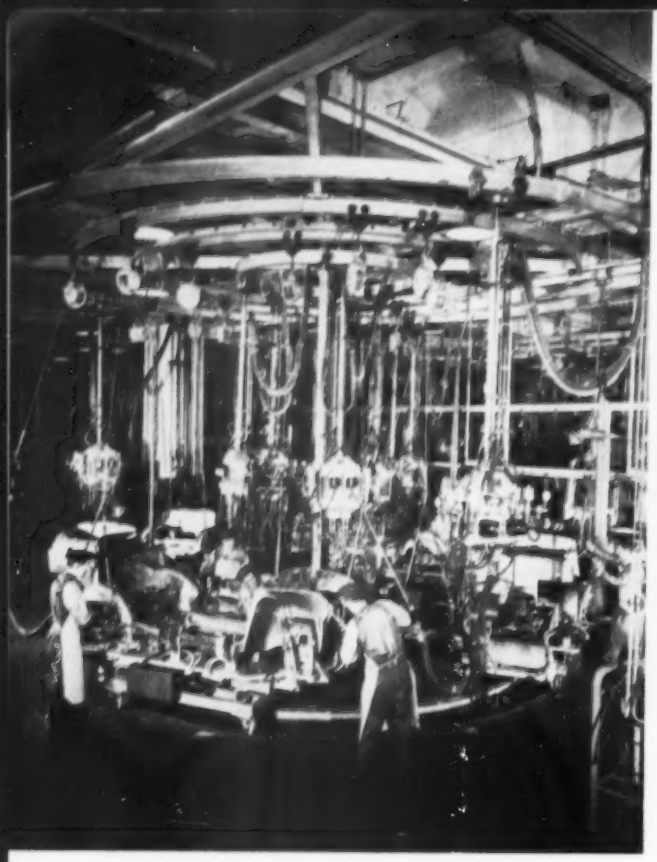
## Midwest...

**Midwestern notes . . .**

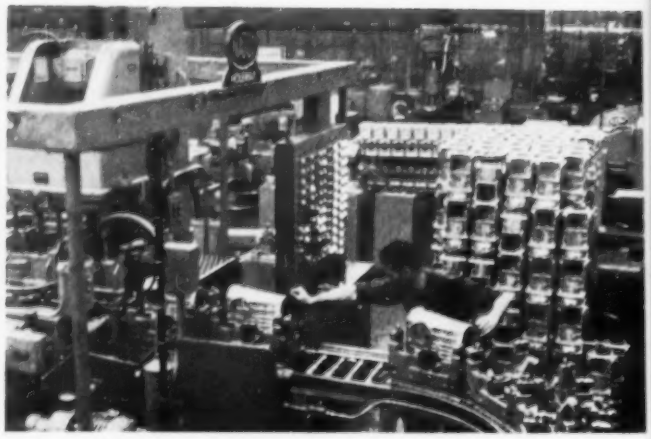
**Republic Steel Corp** has initiated an $8-million program for boosting titanium melting, preparation, forging, and laboratory facilities at Canton and Massillon, Ohio. Output of ingots and alloys will be upped to 6000 tons annually . . . **Studebaker-Packard Corp's** subcontract work on the Air Force's J-57 jet engine is being transferred to **Curtiss-Wright's** newly-formed subsidiary, **Utica Bend Corp**, South Bend, Ind. Abandonment of the Grand Boulevard plant ends S-P operations in Detroit . . . **Ford Motor Co**, according to **Advertising Age**, spent $1308 in advertising on each Continental it sold last year . . . **McKay Machine Co** is merging with the **Metal Processing Machine Co**, both of Youngstown, Ohio; MPM will operate as a McKay subsidiary . . . **General Electric's Metallurgical Products Dept** workers in Detroit and Edmore, Mich, have received a 1% cost-of-living boost in wages; increase results from a "better living plan," announced by the local GE unit a year ago . . . **Standard Thread Gage Co**, Detroit, has changed its name to **Godwin Gage Co**, effective Sept 1 . . . **Metal Finishing Show** will be held Oct 30 through Nov 2 in Cleveland. Working exhibit, sponsored by **Behr-Manning Co**, division of Norton Co, will be located at 4101 W 150th St, the abrasive manufacturer's Cleveland branch . . . **Ford** summary of its employment situation in the Detroit area, and the company's preliminary estimate for employment during model changeover period: hourly employment now totals 67,264, up 1100 from a month ago, with laid-off workers down 31.4% over figures last issued in March; downtime will be scheduled so that an average of some 5100 workers a week will be off; spokesmen report that even during heaviest layoff period less than 15% of the hourly work force will be affected . . . **Fansteel Metallurgical Corp**, North Chicago, will build a $6-million plant to increase present production of tantalum by 50% and columbium by 150% . . . **Seneca Wire & Manufacturing Co**, Fostoria, Ohio, has scheduled a million-dollar expansion and modernization program. Company will have more than 500,000 sq ft of production floor space, including a new building, re-vamping of the entire electrical system, addition of new production units and machinery . . . **Timken Roller Bearing** sends digests of remarks made at bargaining sessions with the Steelworkers to the company's 13,000 union members, posts complete transcripts of current contract negotiations for workers to read . . . **Libbey-Owens-Ford Glass Co**, Toledo, has completed a $54-million expansion program out of company funds . . . **Chrysler** is coming out with a central air-conditioning system for the home. Package, priced at under $600, can be owner-installed; unit will cool a five-room ranch home, uses no water . . . **Ford Motor** and **Northville Oil Co** are squabbling over ownership and full rights to a 9.5-acre tract at the new Lincoln plant outside Detroit. Northville has an oil lease granted by the former owners of the property.



**FRANKLIN PARK, ILL.**: Contour turning of a jet-engine shaft to tolerances within 0.002 in. is accomplished at Diversey Engineering Co here using an air-gage tracer-equipped Monarch 20-in. manufacturing lathe equipped with high-speed tools to achieve 63 mu in. or better surface finish in standard runs



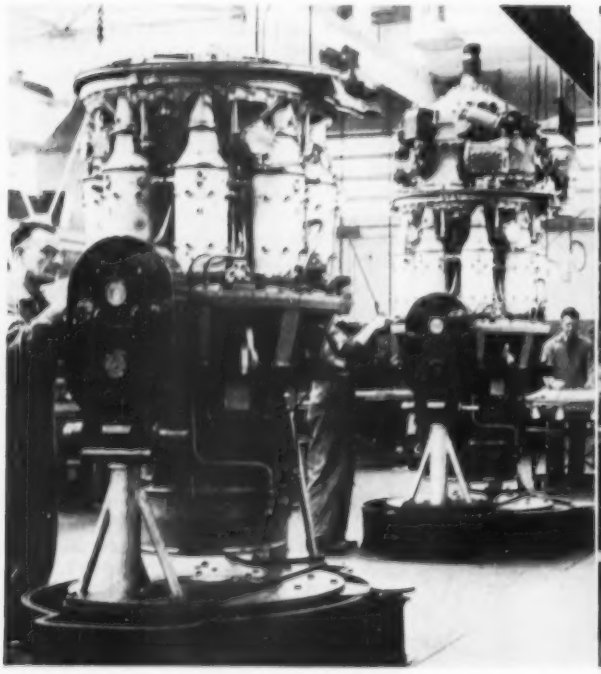
# The Camera Catches



## ITALY: Modern methods

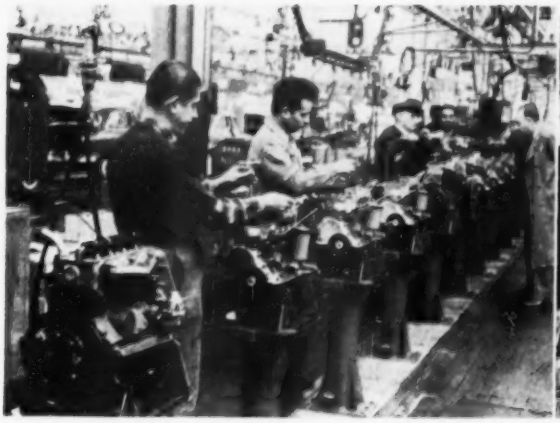
**LEFT:** Merry-go-round assembly of automobiles at one of Fiat's plants. **ABOVE:** U S machine tools are used in transfer machining of cylinder blocks

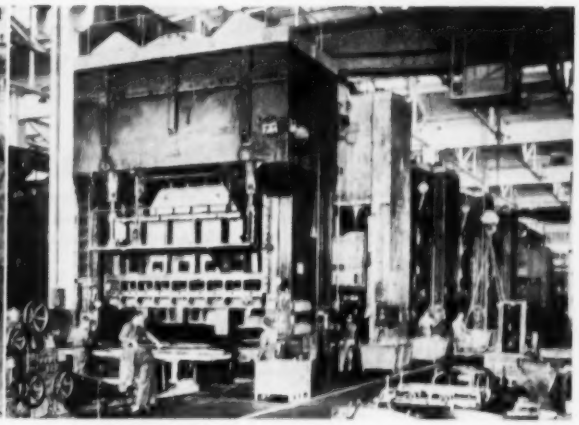
## ENGLAND: Building the Bristol Proteus



**LEFT:** engines are mounted on a hydraulic lift that can be lowered into the floor as the engine is built up. Compressor casing is being fitted on engine at rear . . **RIGHT:** Stator blades are fitted into compressor casing, which is cast in two halves. Blades are fixed in grooves around the inner wall, are held in position by locking bolts (on casing in foreground). All stator blades and all compressor rotor blades are steel

# the Metalworking World at Work





## keynote operations at Italy's Fiat combine

**AUTOMOBILE ENGINE ASSEMBLY** at Fiat's Miraflori plant in Turin. Fiat also makes aircraft, naval and commercial marine transport

**ROW OF GIANT PRESSES** at one of Fiat's plants is made up of presses from many countries. One in foreground is made by U S's Clearing Corp

## RUSSIA: Turret-lathe manufacture

**THIS IS A LATHE ASSEMBLY LINE** at Moscow's Red Proletariat Machine Tool Plant. This particular line assembles six-position turret lathes, is said to turn out as many as 54 a day. But while machine tool output has been stepped up tremendously in the Iron Curtain countries, it's mostly for export and ultramodern machine tools and methods are the exception rather than the rule in Russia's machine tool plants

**Edward J Shages** (left), factory manager of Pratt & Whitney Co's Cutting Tool and Gage Divisions, has been named vice president and manager of the divisions. **James B Wilkie,** assistant manager of the divisions, has been appointed manager of the Gage Division

**Edward S Coe, Jr,** vice president of Farrel-Birmingham, has been appointed general manager of the company's Consolidated Machine Tool Division, Rochester, NY. **Lester D Chirgwin,** who formerly headed the division, is on leave of absence until his retirement at the end of the current year

# Names in the News . . .

**Kenneth V Knebel** has been named general manufacturing manager of the New Departure Division of General Motors Corp. **Donald C Stewart,** master mechanic at the division's Sandusky, Ohio plant, takes over Mr Knebel's post as plant manager there. **John W Schee** has been named successor to Mr Stewart.

**Ray G Knapp, Jr,** has been named assistant to the sales manager of Motch & Merryweather Machinery Co's Machinery Manufacturing Division. **C H Priefer** has been made district sales manager for the four M&M branch offices. **David S Baus** has been appointed district manager for the territory including the Eastern seaboard, New York State, and eastern Pennsylvania.

**Ernest Schleusener,** formerly vice president, manufacturing, of Mueller Brass Co Port Huron, Mich, has been elected vice president, treasurer, and a director of Rodney Hunt Machine Co, Orange, Mass.

**F E Pringle,** formerly associated with Sperry Products, Inc, in sales management posts, has joined Howe Scale Co, Rutland, Vt, as assistant general sales manager.

**Herbert D Bissell,** director of merchandising for Minneapolis-Honeywell Regulator Co, has been elected a vice president of the company. Additional vice presidents named are **W W Gilmore,** president of the Micro Switch Division, Freeport, Ill; **Stephen F Keating,** vice president of the Aeronautical Division; **K L Wilson,** manager of the Residential Division; and **Gavin S Younkin,** general sales manager.

**V H Peterson** has been named vice president, engineering, of Fairbanks, Morse & Co, Chicago. **James G Graham** has been appointed general manager of railroad sales to succeed Mr Peterson.

**Paul J Chaney** has been appointed commercial products sales manager of the Metals Processing Division, Curtiss-Wright Corp, Buffalo. Prior to joining the organization Mr Chaney was sales manager of Oliver Corp's Press & Special Machinery Division, York, Penna.

**R F Myers** has been appointed sales manager of Motch & Merryweather Machinery Co's Machinery Manufacturing Division. He was formerly general sales manager of Lees-Bradner Co (additional appointments above)

**Robert A Cole** has joined Cincinnati Gilbert Machine Tool Co as sales manager. He was formerly vice president and sales manager of Bryant Machinery & Engineering Co, Chicago

**A King McCord,** former president of Oliver Corp, Chicago, has been named president of Westinghouse Air Brake Co, Wilmerding, Penna. He succeeds **E O Boshell,** who will continue as chairman of the board

**Foster H Pettay,** senior vice president of Ohio Crankshaft Co, has been elected president. **M J Hoke,** vice president and general manager of the Camshaft & Crankshaft Division, has been named senior vice president and general manager of the company

**Walter Kassebohm,** vice president, manufacturing, Marchant Calculators, Inc, Oakland, Calif, has been named to the new post of executive vice president, operations

**Charles R Bender** has been appointed assistant executive secretary of the National Tool & Die Manufacturers Association

**Milton J Steffes** has been appointed chief engineer of Super Tool Co, a subsidiary of Van Norman Industries, Springfield, Mass. He has been associated with the company for 14 years in various executive engineering capacities.

**H J Meany** has been named manager, Texas Division, Waco, for Norris-Thermador Corp. He was formerly manager of engineering, maintenance, and tooling at Thermador Electrical Manufacturing Co, N-T division in Los Angeles.

**B Harold Lewis,** New York district manager for the Grinding Machine Division of Norton Co, has retired after a 41-year association with the company. **Frank H Madigan,** a member of the sales engineering department, has been appointed district sales engineer for the New York area.

**J M Bryant,** chief engineer of Link-Belt Co's Indianapolis ball and roller bearing plant, has been appointed by the American Standards Organization to serve as a member of the delegation to the International Standards Organization meetings of the Technical Committee 4 in Vienna, Austria, from Sept 17-26. Others named: **Gunnar Palmgren,** vice president, engineering, SKF Industries, Philadelphia; **Harry Slusser,** standards engineer, Timken Roller Bearing Co, Canton, Ohio; and **Harry O Smith,** secretary-manager of the Anti-Friction Bearing Manufacturers Association.

**Robert K Johnson** has been named sales manager for electronic components manufactured by the Borg Equipment Division of George W Borg Corp, Janesville, Wis. Formerly assistant sales manager, he succeeds **N W Alexander,** who resigned to form Redford Corp, Schenectady, NY.

**Fritz Koenig,** formerly associated with George Scherr & Co, New York, has organized a new company, Opto-Metric Tools, Inc. Mr Koenig will serve as president and general manager.

**C E Heimstadt** has been named plant superintendent for Weber Aircraft Corp, Burbank, Calif, aircraft components manufacturer. He was formerly general fabrication foreman.

**Kenneth W Self** has been named vice president of Freightliner Corp, Portland, Ore, manufacturer of White-Freightliner trucks. Prior to the appointment he was production manager of the parent company, Consolidated Freightways.

**F Weldon Munson** has been appointed director of industrial relations for Dreis & Krump Manufacturing Co, Chicago.

**Paul Dollard** has been elected president and general manager of Century Engineers Inc, Burbank, Calif. Formerly vice president of Hunter Douglas Aluminum Corp, he replaces **R Q Parsons,** named president of Century Electronics & Manufacturing Corp, a subsidiary.

**Richard C Slater** has been named assistant gas truck sales manager for Yale & Towne Manufacturing Co. He succeeds **Robert L Brown,** promoted to sales manager of electric trucks.

**Joseph A Geisler** has been appointed assistant factory manager of Autonetics, a division of North American Aviation, at Downey, Calif. The division is engaged in development and production of electromechanical control and information processing equipment. Mr Geisler has been serving as superintendent of sheet metal and electronic manufacturing departments.

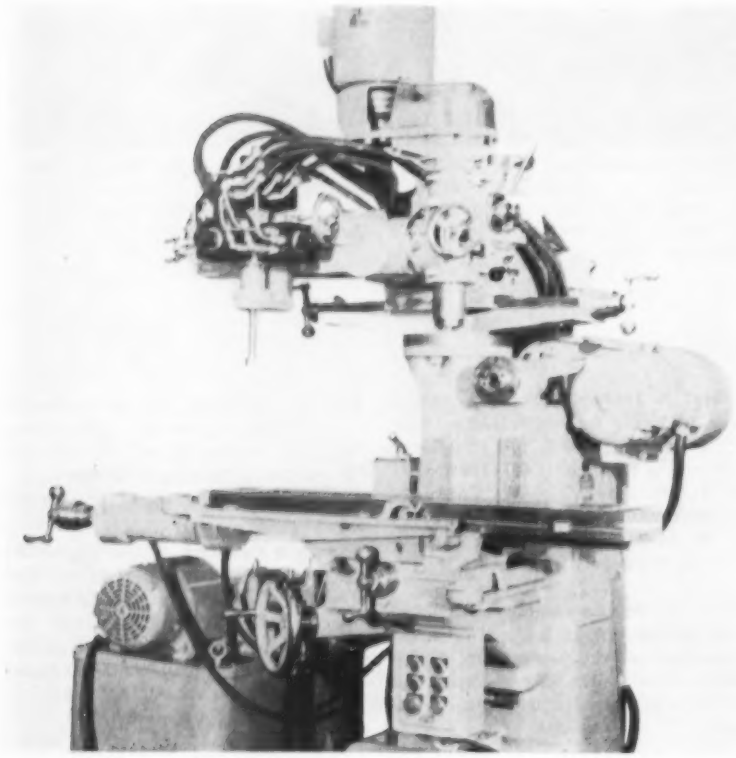
**R L Gray,** executive vice president of Armco Steel Corp, Middletown, Ohio, has been elected president. He succeeds **W W Sebald** who has resigned from that office after 50 years with the company. Mr Sebald will continue to serve in an executive capacity as vice chairman of the board.

**Clifford C Mendler,** general sales manager of the Appliance Division of Sunbeam Corp, Chicago, has been elected a vice president of the company.

**Robert W Spacek** has been named superintendent of the Wellman Bronze & Aluminum Co's (Cleveland) Peerless Plant.

**Jack Kleinoder,** secretary-treasurer of Volkert Stampings, Inc, Queens Village, Long Island, NY, is in Yugoslavia as a member of an official US Dept of Commerce mission that will be in attendance at the Zagreb International Fair Sept 7-20.

# New Shop Equipment



## Axelson Milling Machine Incorporates Three-Dimensional Hydraulic Duplicator

Model 10RH milling machine will mill, jig-bore, and duplicate in three dimensions. Machine has a hydraulic duplicator attachment for making duplicate molds and dies or for contour milling to templets.

Duplicator sensing tracer head controls movement of the table, knee, and ram slide. As operator moves the stylus over the master, the cutter duplicates his movements. Only 4 oz of stylus pressure are required to reproduce accurately a metal, plastic, or wood master.

Unit has a reversible ram turret with all-angle spindle head at one end and slotting head at the other. Entire turret rotates 360°, so that machine can be converted from milling to slotting in a few seconds. Any compound angle can be easily obtained.

Both the vertical and horizontal heads carry No. 30 NST spindle tapers, making tool interchange simple. Vertical spindle has speed changes from 75 to 6400 rpm at 1½-hp torque. Horizontal spindle has range from 55 to 3600 rpm at either 1 or 2 hp.

The 42 x 9-in. table has an optional power feed. Total longitudinal table travel is 44 in.; traverse is 26 in.; clearance from spindle to table top is 22 in. Magnetic tracer valve and 14,000-rpm heads (for high-speed work) are available.

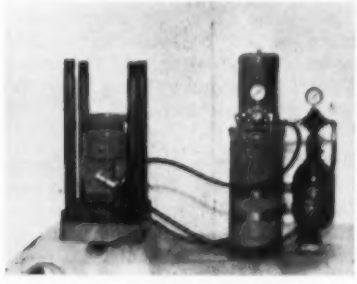
*Axelson Mfg Co, Div of US Industries, Inc, PO Box 58335, Vernon Station, Los Angeles 58, Calif*

### Ross Safety Valve System Protects Press Operators

Two-hand safety for operators of presses, brakes, and shears is provided by non-tie-down valve and a pair of pilot valves. Non-tie-down valve is interposed between two palm-button 3-way valves in parallel and the receiver that is to be alternately pressurized and exhausted.

If operator engages or disengages only one of the pair of palm-button valves, the n-t-d valve will automatically cut off any subsequent air flow through itself to the receiver. Recocking of the n-t-d valve for safe two-hand operation can then be accomplished only by releasing the engaged pilot valve. To permit a reasonable delay between engagement of one palm valve and the other, a tamper-proof integral adjustment is provided in the n-t-d valve. System is applicable to most air-operated, single-stroking machinery.

*Ross Operating Valve Co, Detroit, Mich*



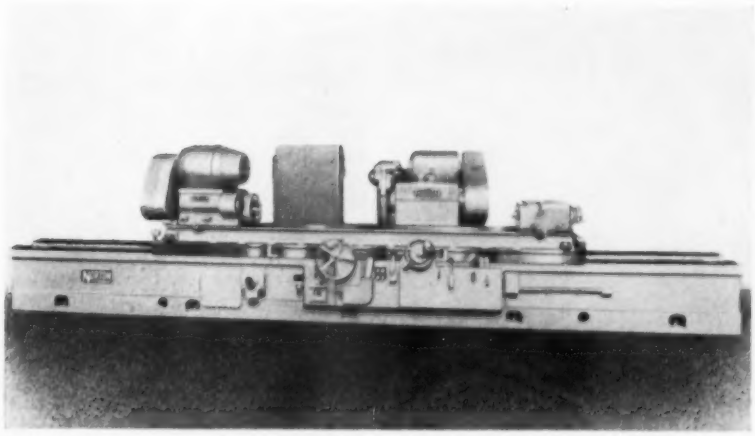
### Dayton Rogers Improves Hydraulic Press-Bed Jack

Improved press-bed jack is a precision hydraulic relief device designed for use in punch presses where such operations as embossing, marking, pressing, riveting, swaging, and briquetting are being performed. Unit may be mounted to press bolster plate or fastened to press bed proper. It serves as a safety overload means: when a preset tonnage is reached, the jack automatically relieves, allowing precise control of the operation even though variations are present in the stock.

Four models are offered in the DRJ Series, handling maximum tonnages from 19 to 66.

*Dayton Rogers Mfg Co, 2824 13th Ave S, Minneapolis 7, Minn*

# Materials and Parts . . .



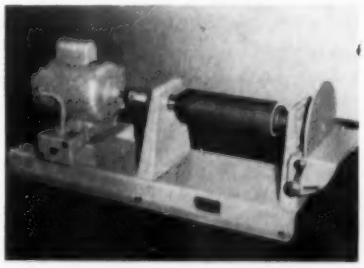
## Norton Heavy-Duty Cylindrical Grinders Hold 6500-lb Work on Centers

Available in plain or semi-automatic types, 14-in. Type C-2 and 18-in. Type LC-2 heavy-duty cylindrical grinders are designed to handle work weighing up to 6500 lb on centers. Semi-automatic models have an automatic grinding cycle which operates under simple one-lever control.

Location of all controls for feeds and speeds on front of machine at operator's position permits a saving of time, particularly in setting up operations. Graduated handwheel continually indicates amount of infeed as the wheel rotates past a fixed pointer, and "click-count" indexing mechanism permits settings in increments of 0.0001-in. work-diameter reduction instantly and without visual attention. Table speeds for truing and grinding are independently adjustable and preset. Other time-saving features: work-jogging lever; automatic or manual control of work rotation and coolant flow; automatic adjustable wheel feed at table reversals, with automatic wheelhead resetting and separate dwell controls for each end of table reversal.

Table drive by hydraulic power is available from 2 to 240 ipm. Pressure-lubricated wheel spindle bearings enclose over 50% of spindle body for maximum rigidity. Metal-to-metal contact in all feeding mechanisms produces fast spark-out and enduring precision. Ramped coolant tank eases tank clean-out, and hinged wheel-guard cover speeds wheel changes.

*Norton Co, Worcester 6, Mass*



## Mathewson Rotary Finisher-Buffer Is Compact Bench-Model Machine

Rotary finisher and buffer uses a standard hinged roll, on which any type of emery cloth, sandpaper, or buffing cloth can easily be placed. Bench-model unit is available with or without disk attachment. Work rest for this attachment is adjustable from 45 to 90°.

Specifications: 1/3-hp, 110v, 60c, 1-phase motor; direct drive of 1750 rpm; over-all size, 35 x 12 x 14 in.

*Mathewson Machine Works, Inc, 80 Hancock St, Quincy 71, Mass*

. . . including


**MACHINE TOOLS AND ATTACHMENTS**

Gear-Shaver Loading Device 188
Tool and Cutter Grinder 190
Wet Surface Grinder 192
Heavy-Duty Die Grinders 194
Small Drill-Tap Units 200
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**TOOLS AND ACCESSORIES**

Tool Adaptor Bushing 188
Automatic Indexing Table 190
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All-Angle Vise 212

**FORMING AND CASTING**

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Shaft-Straightening Machine 192
Radial Draw Former 194
Hydraulic Trim Press 196

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Degreasing Machine 196
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Elevating Conveyor 202

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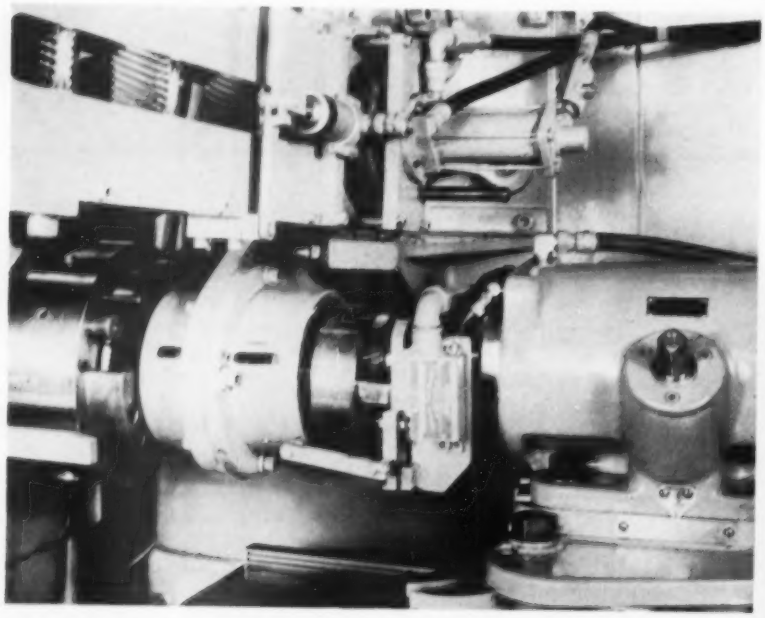


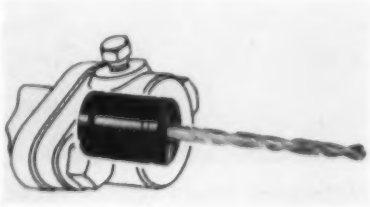
## Red Ring Loader for Internal Shaver Handles Spur or Helical Gears

Automatic loading device for handling spur or helical internal gears on shaving machines can be installed on company's Model GCR internal shaver (*AM*—Jul 16 '56, p173), and is said to solve the problem of meshing the teeth in an internal gear with those of the helical shaving cutter. Loader will handle a 75-tooth, 20-pitch, 4-in.-PD gear at rate of 70 per hour.

In operation, gears to be shaved are loaded in a magazine, where they roll by gravity to a position in front of an air-powered plunger. Plunger pushes one gear at a time into a loading sleeve; pushing an unshaved gear into the sleeve at this raised position (not shown in illustration) causes a finish-shaved gear from the preceding operation in the other end of the sleeve to be deposited in an unloading magazine. Sleeve now is swung downward through an arc, by an air cylinder, into line with work-spindle centerline.

Illustration shows sleeve in its lowered position, in line with workhead centerline. A finish-shaved gear has just been deposited in the left-hand end of the sleeve. Gear to be shaved has been ejected by entry of finished gear from the sleeve at the right-hand side, and is hanging on the shaving cutter. In the next sequence, the sleeve will swing upward out of the way and the cutter spindle will advance to the left, where the gear will be chucked in the workhead. Once shaving is completed, sleeve will swing down again with new workpiece, finished gear will be deposited in left-hand end of sleeve, and unshaved gear will be ejected by this action onto cutter.

*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich*



### New Adapter Bushing Design Speeds Setups, Cuts Slippage

Non-slip, split-type adapter bushings for positive gripping of drills, reamers, taps, and boring tools, are designed for either automatic screw machine and turret lathe rigid or floating holders.

Split-type construction clamps entire length of bushing, also eliminates pounding tools in and out of holders. Two flat spring collars keep bushing halves in alignment; spring tension permits precision setting of tools with gages before tightening clamping screw. Sizes include ½-in.-dia, ⅝-in., and 1-in. Other sizes on special order.

*Marcellus Manufacturing Co, Belvidere, Ill*

### Erie Drop Forging Hammer Has Piston Lift, Gravity Drop

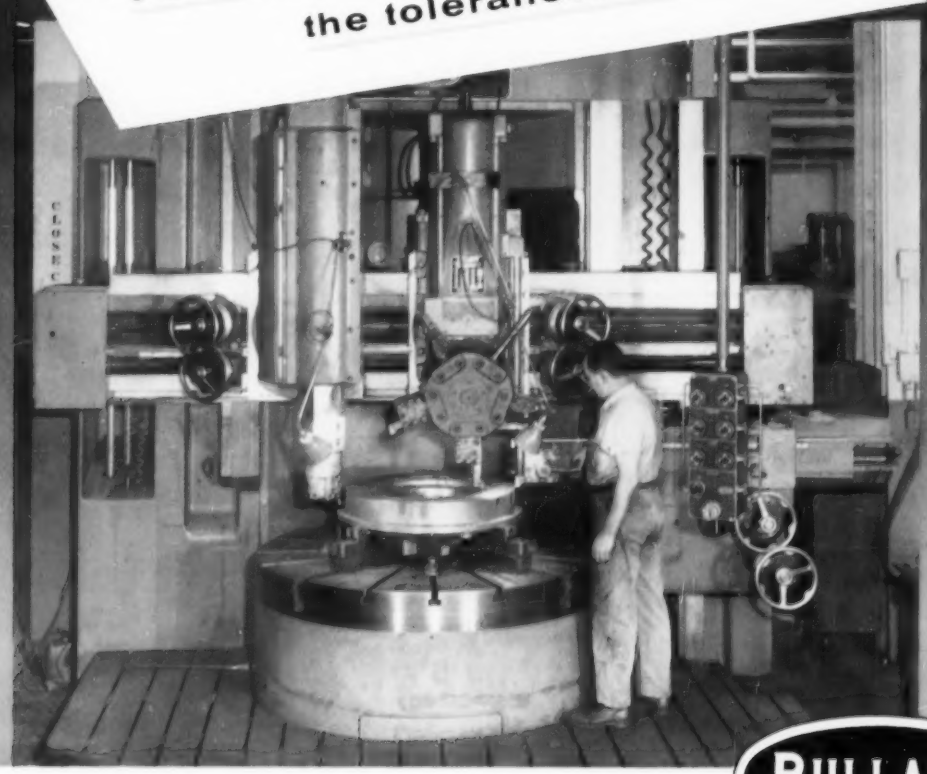
Called the Rigidrop, all-steel air-operated hammer gives its operator complete control of stroke variation, allowing him to select from the full range of strokes between conventional short and long by varying pressure on the hammer's treadle. Available in sizes from 1500 through 5000 lb, hammer works on piston-lift and gravity-drop principle.

Redesigned guiding arrangement is said to provide 40% more guiding surface on the ram than previous models offered, so that guiding accuracy is increased and constant die adjustment is maintained. Guide-ram adjustments are easily made from front and back at close to floor level; ram can be removed from the hammer at die level, without jacking.

Machine is designed for maximum forge-shop safety, with no loose linkage or overhanging parts. A cushion head affords protection if the hammer is overstroked. Other features contributing to easier operation include a built-in inching mechanism for die setups and an improved clamping system. Clamp faces are set directly opposite one another to provide positive clamping action without bending the rod. Bulletin No. 361.

*Erie Foundry Co, Erie, Penna*

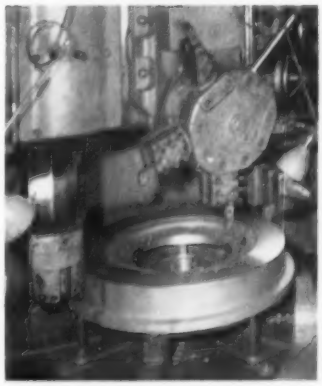
# "Few machines would hold the tolerances required"



BULLARD

This statement by Mr. R. P. Feiser, Industrial Engineer of the York Corporation, York, Pa., is one of the reasons for their purchase of a 66″ Cut Master, V.T.L., Model 75 for the machining of a rotor support for their turbomatic compressor.

Mr. Feiser further states that "the 66″ Cut Master does this machining at a saving of 40% over any previously used machine. In addition, the pendant control and power swiveling turret head are a great convenience in operation — the result is a low operator fatigue factor. Also, the York Corporation has experienced low maintenance costs on a 60″ Vertical in operation since 1928 and a 36″ Vertical in operation since 1937."

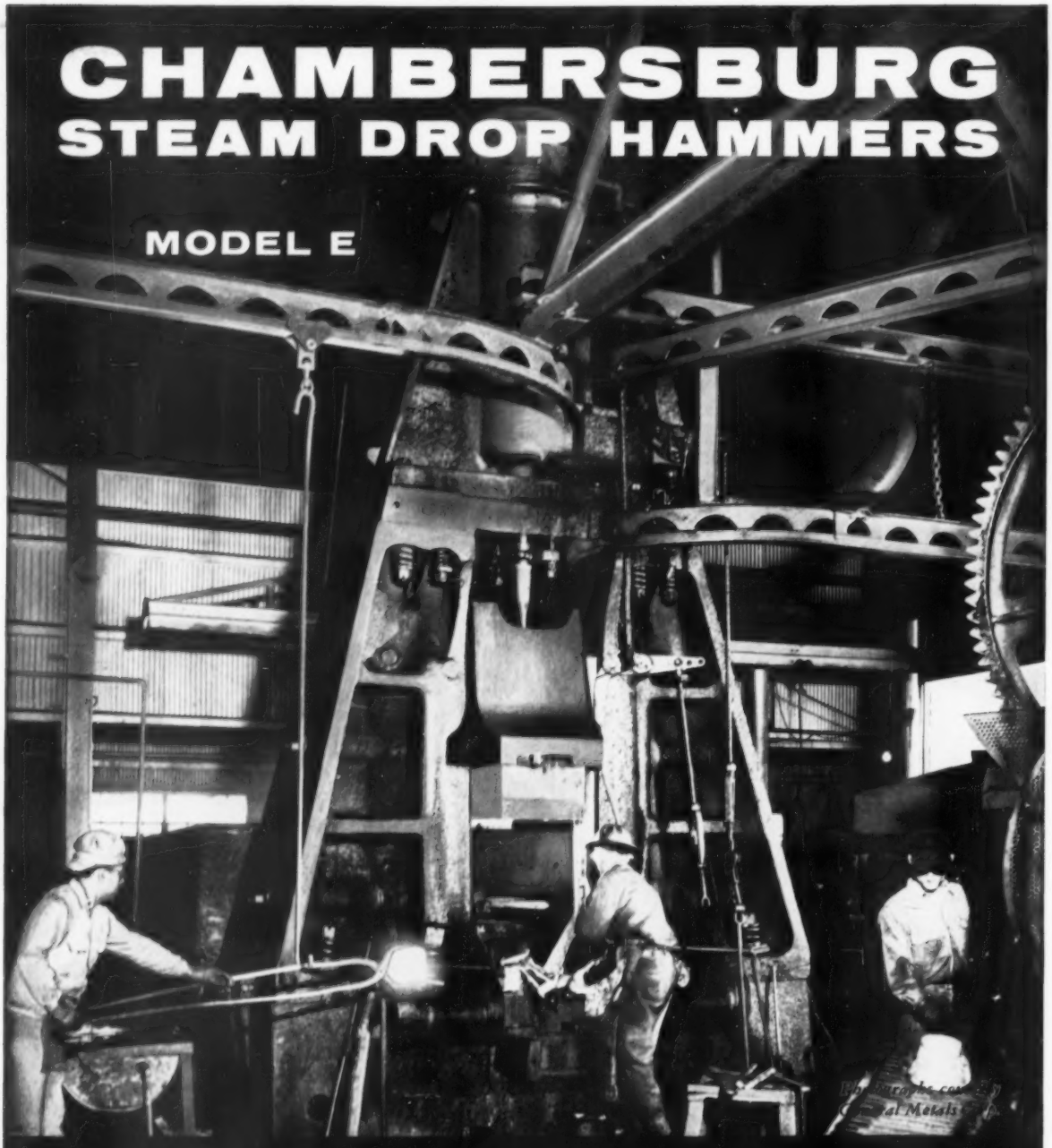


*How about You?* Are you employing these same advantages to your machining problems? If not, may we recommend that you get the complete Cut Master V.T.L., Model 75 story by calling your nearest Bullard Sales Office, Distributor or writing for a catalog to

THE BULLARD COMPANY
BRIDGEPORT 9, CONN.

# CHAMBERSBURG
# STEAM DROP HAMMERS

MODEL E



## MODERN FORGING REQUIREMENTS DEMAND MODERN HAMMERS ·

Shown above is a 6000 lb. Model "E" Chambersburg Steam Drop Hammer forging 4" alloy steel valve bodies. A Chambersburg 200 ton Steel Side Trimming Press is used to complete the operation. The Chambersburg Model "E" Hammer pays its way through increased production and trouble-free service. Details of this modern hammer are in our Bulletin No. 55-L-4. If interested, write for a copy.

*Trimming Forgings on Chambersburg Trimmer*

**CHAMBERSBURG ENGINEERING COMPANY · CHAMBERSBURG, PA.**

Sperry

# ultrasonic inspection news

## HOW ULTRASONIC TESTING HELPS U. S. STEEL PRODUCE FLAWLESS FORGINGS!

**This turbine generator shaft**—forged and sonic-tested by U. S. Steel—is part of the first nuclear reactor power plant to be built in the United States. The 60,000 kilowatt power plant will go into operation in 1957.

Here, the shaft is being Reflectoscope-tested while it is still in the lathe. The forging will be sonic-tested a *minimum of 5 times* as it progresses through various stages of manufacturing. At U. S. Steel, turbine and generator rotor forgings are tested at these stages:

1. Preliminary sonic test is run on the rough forgings before machining.
2. Forging is rough-turned to bring it into a "round," then sonic-tested again.
3. After a bore has been drilled through the forging, it gets a complete full-scale sonic inspection.
4. After grain-refining (heat-treatment) another sonic test is made.
5. After finish-machining and stress-relieving, the forging is inspected again as specified by the customer.

**All these sonic inspections** are usually conducted while the forging is rotating, except for the as-forged test. A carbide tool finish is used to provide a suitable surface for the double-crystal search unit.

This testing for defects before forgings are placed in actual operation enables U. S. Steel to turn out flawless forgings that *exactly* meet ASTM and customer requirements. Reflectoscope inspection saves U. S. Steel man-hours and money...helps assure customer satisfaction! It can do as much for you. Use the handy coupon to ask for full information.

## *THE SHOW'S ON THE ROAD!*

**Sperry's new ULTRASONIC CARAVAN** is now on a nationwide tour of plants and factories throughout the United States.

The Caravan's compact exhibits will demonstrate every aspect of ultrasonic testing and equipment to management and engineering personnel. You will see all types of Sperry Reflectoscopes, signaling and recording devices—in action... in your own plant... using samples of your own materials or products for testing!

If you are located in one of the nation's larger industrial centers, the ULTRASONIC CARAVAN is probably already scheduled to visit your area. If not, your Sperry Representative will be glad to discuss the possibility of a visit to your plant or area.

To keep posted on latest developments in the profitable use of ultrasonic inspection, send for your copy of our Ultrasonic Inspection News Letter.

Sperry Products, Inc.
602 Shelter Rock Road
Danbury, Connecticut

☐ Send me detailed Reflectoscope information.

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*Company* _____

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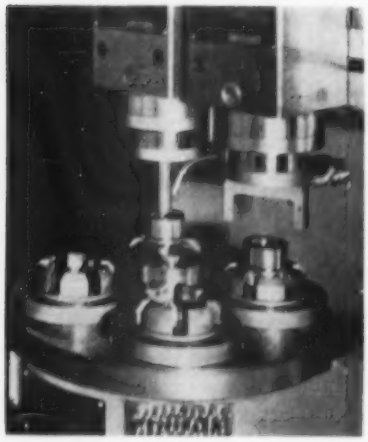
*FIRST IN ULTRASONIC INSPECTION*



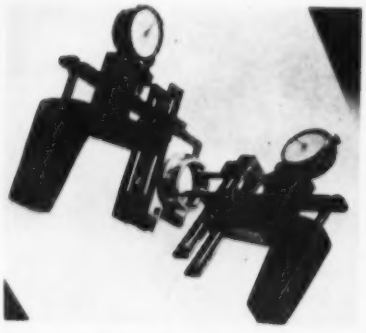
## Wadell Indexing Table Positions Within 0.0005 in.

Model AIT automatic indexing table, guaranteed accurate within 0.0005 in. of true position, is primarily intended for use on company's vertical precision boring machines. Adaptable to other machine tools, it may be used for boring, drilling, turning, or reaming operations.

Index drive features a mechanism which requires only three moving parts. Accuracy is dependent on a master index plate machined by a jig borer which assures that total tolerance of index positions is within 0.0003 in. Lock pin of heavy rectangular cross-section moves on pre-loaded rollers, eliminating all play. Table rotates on pre-loaded, heavy-duty, tapered roller bearings. Hollow spindle affords means to adapt air or hydraulics used to actuate chucks or other holding means.

Standard master plates have 12 index positions; masks are used to obtain spacings of 2, 3, 4, and 6. Irregular spacings can be furnished. Diameters of 12, 18, and 24 in. are standard.

*Wadell Equipment Co, 119 South Ave, Garwood, NJ*



## Mueller Gage Handles All ID and OD Jobs

Designed for both inside and outside measurements, gage checks bores, pitch diameters of even-numbered splines and gears, grooves, recesses, inside spherical radii, and out-of-round objects. O-rings and Truarc ring can be measured with the same set of tips. Interchangeable tips provide a range from 0 to 5.750 in. for outside measurements and 0.187 to 6.270 for inside measurements.

Eleven hard-chromed tips and a base anvil are available for the device. Tips for greater depth than specified are also offered.

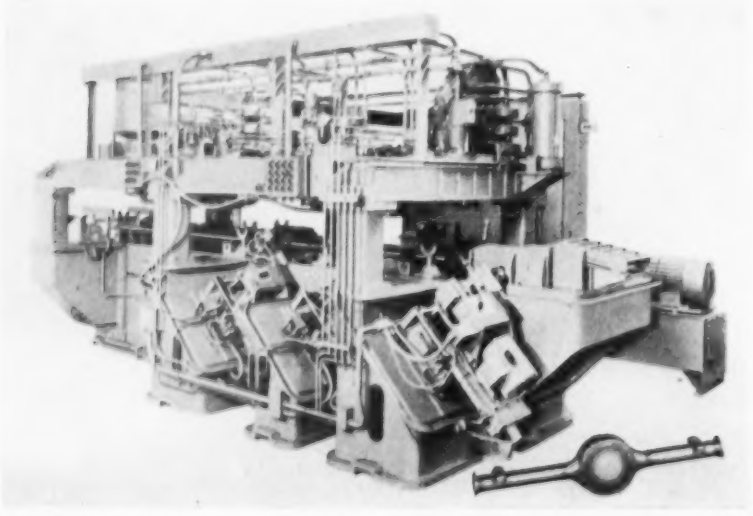
*Mueller Laboratory, Pasadena, Calif*

## Danish Tool-Cutter Grinder

Model USL universal tool and cutter grinder is a precision machine with table size of 36¼ x 5½ in. Main spindle is rated at 3800 to 5750 rpm. Unit features a telescoping metal-enclosed spindle column. Special table and saddle-bearing arrangement insures smooth and free table movement.

Accessories include an all-angle plate for compound grinding and for large cutter heads. Two dust collectors are offered, one for dry-dust collection and another for use with wet-grinding attachment in conjunction with carbide-grinding operations.

*Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY*



AUTOMOTIVE REAR-AXLE HOUSINGS are processed on automatic unit called Lina-O-Matic, which pierces, extrudes, machines, and assembles as well as loads and unloads. Part is located up and down from 4 points on banjo face; endwise location is taken from 4 points inside banjo; angular location is taken outside banjo on tube. Machining operations include tapping drain hole and drilling and deburring vent hole—*LaSalle Tool, Inc, 3840 E Outer Dr, Detroit 34, Mich*

**Hercules Swif Solder 50-50,** a tin-lead solder combined with an active flux, is applied with a brush or standard applicator. Product is heated with irons, torch, or in production line ovens. When heated it cleans, tins, and solders in one operation, requires only wiping with damp cloth to complete the job.

*Hercules Chemical Co, 416 Broadway, New York 13, NY*

# When steel is 3 times stronger than iron . . .

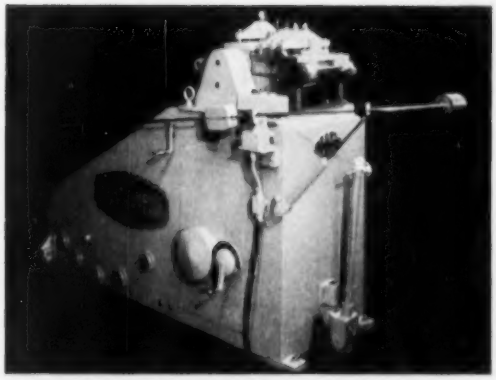
# Has two and one-half times the rigidity . . .

# Yet costs a third as much per pound . . .

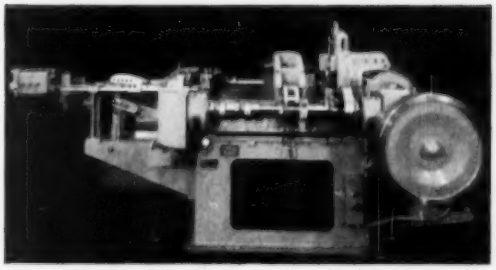
# WHY

## aren't more of your products designed for welded steel?

*Photos courtesy U. S. Tool Company, Inc., Ampere, New Jersey.*



*Present welded steel design.*



*Present welded steel design.*

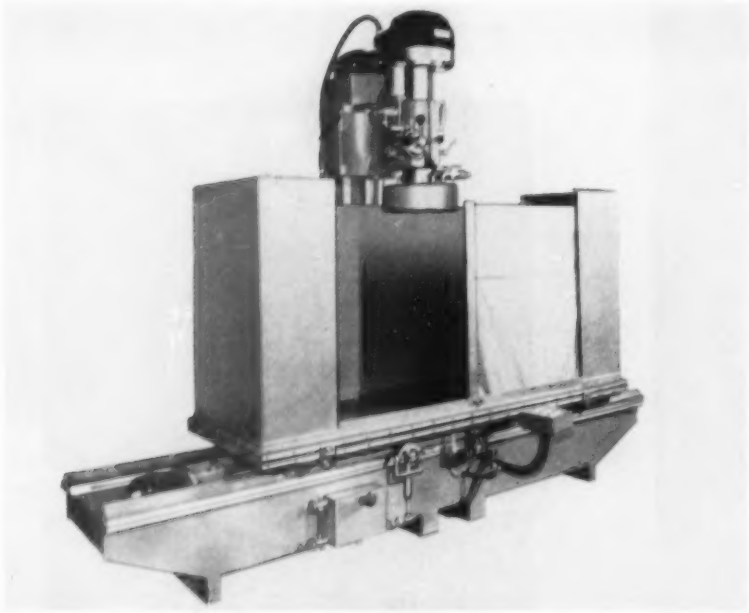
## Cuts high replacement costs... after switching to welded bases

AFTER casting failures resulted in expensive replacement costs, this machine tool manufacturer converted his base designs to welded steel. Bases are now practically breakproof. Greater uniformity in dimensions saves time in locating parts in jigs. Appearance is greatly improved.

Lincoln can show you how to convert your designs to welded steel for similar savings and benefits. Write us today.

**THE LINCOLN ELECTRIC COMPANY**
Dept. 2014, Cleveland 17, Ohio

*Creating lower costs for industry ... with welded steel*



## Tillis Wet Surface Grinder Holds Tolerances to 0.0002 in.

Model 117 surface grinder, originally planned for the automotive service field, is said to hold to tolerances of 0.0002 in. Grinding wheel is 16 in. in diameter and takes work up to 42 in. high and 72 in. long. Feeds on both spindle and table are automatic, and machine completes full cycle without attendant.

V-ways on tables and base are hand scraped, and lubrication is of forced-feed type. Special jig permits quick, easy setups and turns work over for two or more side grindings. Head raises and lowers on hand-scraped ways driven by geared-head motor.

Spindle is mounted on two pairs of precision ground, angular-contact ball bearings. Motor is a 10-hp, axial, air-gap type of 1730 rpm. Base length is 144 in., table length 106 in., and table width 30 in. Portable coolant tank is mounted on wheels. Catalog 117.

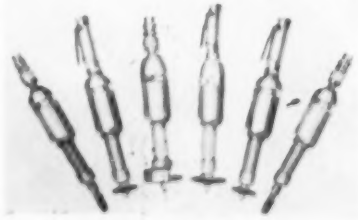
*Tillis Mfg Co, Elkhart, Ind*

### Shaft-Straightening Machine Handles 600 Parts per Hour

Designed for handling work in preparation for centerless grinding, automatic shaft-straightening machine handles 600 pieces per hr. Synchronization with grinders is not necessary, because a 30-part storage chute automatically starts and stops the straightener as parts are demanded by grinder line. Straightness is held to 0.0015-in. TIR at center. Out-of-straightness up to 0.125-in. TIR at center can be accommodated.

Shafts are fed from a loading and storage hopper to a walking-beam conveyor which carries them to the straightening station. Here rolls apply a programmed load at the shaft center while shaft is rotated. Gaging station checks the straightened shafts; reject mechanism removes those outside tolerance. Conveyor advances those within tolerance to feeder for grinding operation.

*Cargill Detroit Corp, 2254 Cole Ave, Birmingham, Mich*



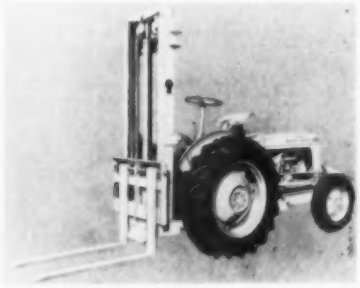
### Heavy-Duty Die Grinders Available in Three Sizes

Heavy-duty die grinders available in three models ranging from 3-in. grinders at 12,000 rpm to ¼-in. collet-type tools at 20,000 rpm feature 75% interchangeable parts. Tools are available either with lever throttle or with Hunt Quick-as-Wink valve (a sliding valve with air apertures arranged to give operator close control of tool).

Noise level is kept low by channeling exhaust air through more than 100 milled, gear-like slots around circumference of motor housing. Turbulence thus set up is said to reduce exhaust air noise. Escaping air is diverted from work and away from operator's hands through a thin-walled steel deflector shell which can be rotated.

Tools weigh about 5 lb, lengths vary from 12¾ to 14¼ in. Cylinder liners are ribbed for strength, and end plates are machined from steel, carburized, and hardened to assure long life.

*Master Pneumatic Tool Co, Inc, Bedford, Ohio*



**FORK-LIFT TRUCK, Work Bull Model 202, has 4000-lb capacity and is designed for yard work. Hydraulically steered truck is provided with a gasoline engine which develops 34 hp at belt. Standard features include two speeds forward and reverse, heavy-duty industrial clutch, and separate brakes for right and left rear wheels. 21-ft mast extension is available optionally—*Massey-Harris-Ferguson, Inc, Industrial Div, Quality Ave, Racine, Wis***

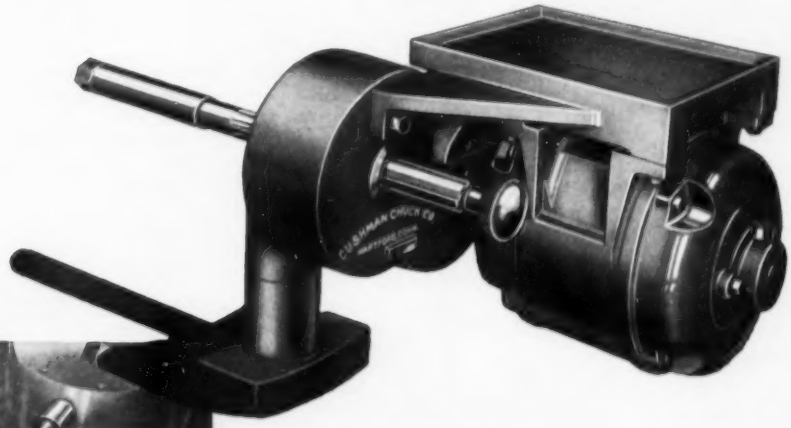
**Marking method** called Diamond Drag uses a special non-rotating diamond cutter instead of a conventional routing tool. Cutter is inserted into the spindle of a tracer-guided New Hermes engraving machine. Work is then clamped, two at a time, in a vise and marked pantographically. Large reduction ratio allows the accurate engraving of a 0.040-in.-high symbol or number. No material is removed from work, and weight and balance of part is maintained.

*New Hermes Engraving Machine Corp, 13-19 University Pl, New York 3, NY*

# CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

## the key to machining efficiency



The Cushman Power Wrench, push-button controlled, eliminates time-consuming, fatiguing, hand wrenching of chucks on single and multi-spindle machines, especially where repetitive machining operations are being performed.

Cushman Power Wrenches are available with either an 8 or 24 ft. lb. motor, delivering a maximum of 180 or 600 ft. lbs. torque respectively. With the addition of the Cushman Variable Torque Control, developed especially for use with the Power Wrench, the operator may, by setting the selector switch, choose any one of 9 approximately equal stages of torque and inertia. Wrenches equipped with 8 ft. lb. or 24 ft. lb. stall-type motors will deliver from 45 to 180 ft. lbs. or 150 to 600 ft. lbs. respectively.

If greater or less driving force is required, the Cushman Engineering Department can design wrenches to suit your needs. Write Cushman for Bulletin No. 211D fully describing and illustrating the Cushman Power Wrench — or, should you have a special work-holding problem, consult Cushman.

**THE CUSHMAN CHUCK COMPANY**
Hartford 2, Connecticut

a world standard for precision

CUSHMAN CHUCKS . . .
A Product of American Quality, Labor and Materials

SEE YOUR INDUSTRIAL DISTRIBUTOR

manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

## Bypass Mechanism Automates Nine Finishing Processes

Part of the Dial-A-Cycle system for automatic metalfinishing, selective bypass mechanism automatically controls as many as nine processes on a single anodizing or electroplating machine. System is controlled from a dial on the carrier arm that moves parts through processing tanks. As unfinished parts are loaded on the carrier, operator sets dial for the processing steps through which the load is to move. Automatic conveying does the rest, lowering parts into prescribed tanks, bypassing others.

Heart of system is a series of limit switches and solenoid-operated setdown flippers that control action of carrier. Different dial settings change the position of a "flag" which subsequently contacts or passes switches and flippers at each tank in the metalfinishing sequence.

*Hanson-Van Winkle-Munning Co, Matawan, NJ*

**Anchor nuts** with high corrosion resistance are said to be suitable for use at elevated temperatures to 900 F, adequately meeting the 800 F classification in the new Air Force-Navy Specification MIL-N-25027. Available in both miniature and regular configurations, nuts are presently produced in tap sizes 6-32, 8-32, and 10-32.

*Kaynar Co, Kaylock Div, Box 2001 Terminal Annex, Los Angeles 54, Calif*

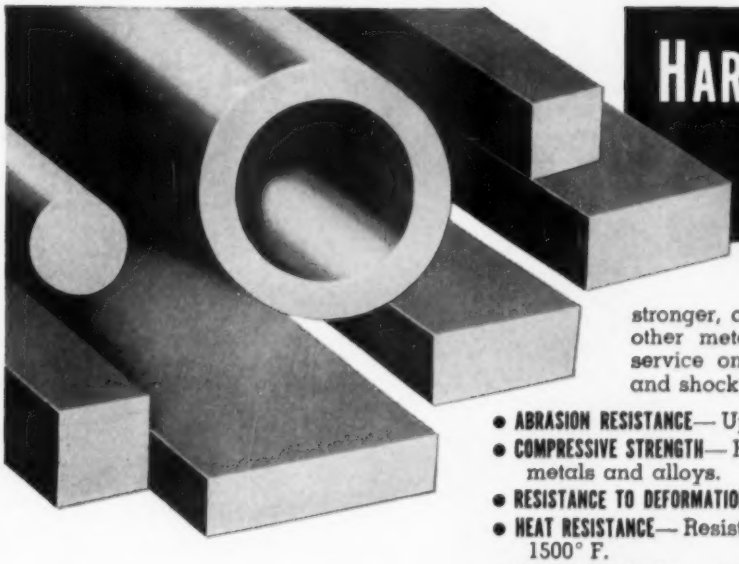
FORK-TRUCK LINE in Safe-Hite Series is available in capacities of 2000, 3000, and 4000 lb. Electric-powered units are designed for use where low headroom is a problem. Battery compartment has been reduced in height, so that operator, who sits above compartment, sits 18 in. lower than on conventional models. All models are equipped with hydraulic lift—*Elwell-Parker Electric Co, Cleveland 3, Ohio*

MILLING CUTTERS for machining brass slabs are designed to eliminate objectionable longitudinal ridges produced when milling scale from slabs. Cutters contain six rows of "one-position" blades in a special construction in which standard spiral-faced flat HSS blades are wedged in straight body slots. This construction permits uniform absorption of wedge pressures, with minimum strain and blade breakage; because cutting edge is on a helix, heavy peripheral cuts can be made. Cutters are offered in all sizes —*Goddard & Goddard Co, Detroit 23, Mich*

75-TON RADIAL DRAW-FORMER, to be installed at Burbank, Calif plant of Lockheed Aircraft, is designed for producing major contoured structural parts, including skin sections, for prop-jet airliner. Machine, approx 47 ft long and 31 ft wide, can form any angle in work, as well as make shapes in reverse bends and two planes. According to contour to be formed, either stretch- or compression-forming is applied. In both methods, work is held at one end in gripper jaws mounted on rotary table and at other end in a second set of jaws mounted on a hydraulic ram on the machine bed; work is held at yield tension and is forced by compression against a rotating die on table to impart desired form—*Cyril Bath Co, 32430 Aurora Rd, Solon, Ohio*

**Air filter** called Sta-Dri contains a highly absorbent cellular material that will absorb moisture and oil vapors without swelling or increasing in particle size. Maker reports that after absorption, material divests itself of moisture. Tests reportedly have shown that filter element will hold 87% of its weight in water and 79% in oil. Reduction in flow of compressed air or gases through the filter elements is only 3 to 7%. Filters are available in 6 models of varying capacities, have a clear plastic container.

*Beach Precision Parts Co, 120 Mechanic St, Boonton, NJ*



# HARDEST MAN-MADE METAL

TALIDE METAL, a tungsten carbide of superior quality, is harder, stronger, and more resistant to abrasion than any other metal. Properly applied, it gives superior service on applications where wear, heat, strain and shock are destructive to other metals.

- **ABRASION RESISTANCE**— Up to 100 times that of steel.
- **COMPRESSIVE STRENGTH**— Higher than all melted, cast or forged metals and alloys.
- **RESISTANCE TO DEFORMATION**— 2 to 3 times greater than steel.
- **HEAT RESISTANCE**— Resists oxidation and thermal shock up to 1500° F.
- **THERMAL EXPANSION**— Less than half the rate of steel, "creep" is negligible.
- **FRICTIONAL RESISTANCE**— Lower than steel, non-galling, "slippery" properties higher.

TALIDE METAL is saving industry millions of dollars annually by wear-proofing vital parts on machine tools, presses, pumps, compressors and other types of processing equipment used in the steel, oil, chemical, plastic, auto, rubber, textile, glass, mining and metal-working industry. The physical properties of the most commonly used grades are listed below. Other grades are available for specialized applications.

## PHYSICAL PROPERTIES OF TALIDE METAL (P. S. I.)

| Application | Operation | Talide Grade | Rockwell "A" Hardness | Specific Gravity (Density) | Transverse Rupture Strength | Compressive Strength | Co-Efficient of Thermal Expansion | Modulus of Elasticity (Deflection) |
|---|---|---|---|---|---|---|---|---|
| WEAR SURFACE | No Shock | C-91 | 91.8 | 14.90 | 235,000 | 710,000 | 3.00 x 10-6 | 91,000,000 |
| | Light Shock | C-90 | 91.0 | 14.75 | 265,000 | 670,000 | 3.65 x 10-6 | 84,000,000 |
| | Medium Shock | C-88 | 89.5 | 14.55 | 295,000 | 635,000 | 4.00 x 10-6 | 80,000,000 |
| IMPACT | Light | C-85 | 88.4 | 14.25 | 315,000 | 600,000 | 3.75 x 10-6 | 77,000,000 |
| | Medium | C-80 | 87.0 | 13.85 | 335,000 | 550,000 | 4.50 x 10-6 | 74,000,000 |
| | Heavy | C-75 | 85.0 | 13.15 | 355,000 | 500,000 | 5.00 x 10-6 | 70,000,000 |

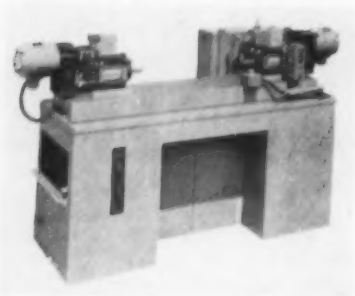
Note: Hardness values may vary plus or minus .2 to .3 on individual lots.

All TALIDE METAL grades are made in latest type vacuum electric furnaces by precision methods under rigid control. A wide variety of shapes and sizes can be supplied—up to 25" in diameter, 100" in length, and 5000 pounds by weight. Parts can be supplied to any grit finish required down to one micro-inch.

Metal Carbides Corporation,
Youngstown 12, Ohio.

*Send for new 76-page catalog 56-G or ask for sales engineer to call.*

UP TO 100" IN LENGTH EXCLUSIVE WITH METAL CARBIDES
METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



## Hause Double-End Machines Adapt To Variety of Operations

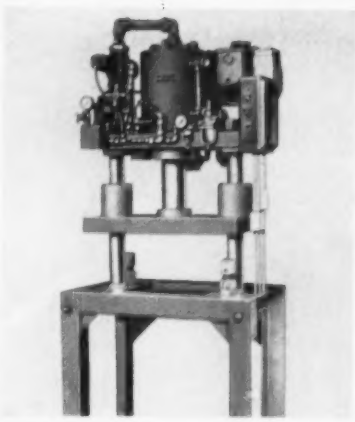
Standard production machines that are designed to perform special machine operations such as drilling, tapping, and other end-cutting tool operations, double-end machines incorporate two Model 24 Holomatic drill units, steel weldment base, and complete air and electric power and cycle control systems. As supplied, all components are mounted, wired, and airplumbed ready for operation.

Holomatic units are tool feeding devices using shop airline pressures for thrust and self-contained sealed hydraulic systems for spindle travel control. Rapid travel movements, feed rates, and stroke lengths are adjustable in both advance and retract motions. Maximum stroke length per unit is 4 in., and maximum work capacity is 2 hp. Spindle speeds from 190 to 10,000 rpm are available.

Long, wide top of machine base allows units and fixtures that are opposed, off-set, and angular to be positioned up to 35 in. apart.

*Hause Engineering, Montpelier, Ohio*

**DIAL-INDICATOR CHECKER called Master replaces the more difficult gage-block method of checking. Accuracy of indicator is checked against a large calibrated wheel, 8 in. in dia with a micrometer barrel as its hub. Indicator contact point is set against micrometer spindle; user turns wheel for a given distance and then checks resultant reading on indicator. Readings to 0.00002 in. can be estimated. Range of device is 1 in.—*Petz-Emery, Inc, Pleasant Valley, NY***

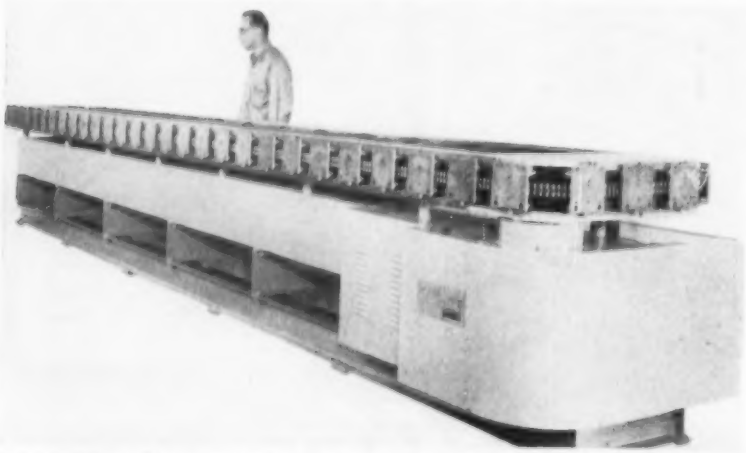


## Mohler Hydraulic Trim Press Offered in 20-ton Model

Developed for the die-casting industry, 20-ton hydraulic trim press can be used for many operations, such as broaching, staking, swaging, stamping, shearing, blanking, and forming. Unit is operated by a 3-hp motor, said to be less than half the motor size for similar presses. Relatively little shop space is needed for the press, which is open on all sides for use of conveyers, chutes, and other parts handlers. All connections to power, air and water are attached at top of machine.

Press operates at speeds in excess of 600 ipm free-ram travel. Vernier fingertip controls provide speed adjustment. Stroke is adjustable from 0 to 12 in., with shut height of 17 in. between platens. Upper platen has 18 x 24-in. free area. Lower platen has 15 x 15-in. cut-out which can be eliminated or varied to suit customer's needs. Working area between uprights is 23 in.

*Mohler Engineering Co, 33 Roetzer St, Buffalo 11, NY*



**INDEXING-MACHINE CHASSIS called Auto-Tran is available as a continuous-motion unit for various processing and manual assembly operations. Construction is identical to company's intermittent-motion model previously announced, except that variable-speed transmission and reducer replace the cycloidal cam indexer. Rate of carrier movement is infinitely adjustable, and is remotely controlled and tachometer indicated. Unit shown is 21 ft long, with 62 carriers on 9-in. centers. Carrier movement is from 2 to 8 fpm—*Swanson Tool & Machine Products, Inc, Erie, Penna***

**Degreasing machine** called 75 Chromplater Vapor Degreaser utilizes the vapors of trichlorethylene or perchlorethylene. Apparatus has a degreasing compartment which measures 18 x 10 x 18 in. Vapors are generated by thermostatically controlled electric heat which boils solvent in the degreaser. Machine operates on 110v, single-phase, 60c current. Two electrical outlets are needed—one for 1600-watt heater and other for spray pump which provides stream of solution for slush cleaning. Cooling coil condenses vapors at a predetermined level, keeping them in the unit.

*Dawson Corp, 302 Fifth Ave, North Pelham, NY*

# cut it with stop

1881 CAPEWELL

# power hack saw blades

**THE USER:** Edgcomb Steel Company, Philadelphia, Pennsylvania

**THE MATERIAL:** High Speed Steel Billets

**THE JOB:** Maintaining precision-true hack sawing

**THE PROBLEM:** Uneven cuts and excessive blade breakage

**THE ANSWER:** Capewell Safetech Power Hack Saw Blades

**THE RESULT:** Power hack sawing now a routine operation—no more production headaches.

Edgcomb Steel Company chose Capewell's shatterproof Safetech blade for this long, heavy job because they could get more cuts per blade, quickly and economically under heavy feed, while providing complete operator safety. Other Capewell power hack saw blades are Technite and High Speed—each of these all-hard blades is designed to give proved maximum sawing performance.

You, too, can improve your production by standardizing on Capewell Power Hack Saw Blades. Tooth by tooth, you'll find that Capewell blades are a superior product, manufactured to rigid specifications, so that you can be assured of blades that stay sharper longer.

75 CAPEWELL ANNIVERSARY

*SOLD ONLY THROUGH CAPEWELL DISTRIBUTORS who provide: complete inventory . . . engineering assistance . . . delivery when you need it.*

**THE CAPEWELL MANUFACTURING COMPANY**
Hartford 2, Connecticut

Please send complete details on Capewell Power Hack Saw Blades to:

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COMPANY_____

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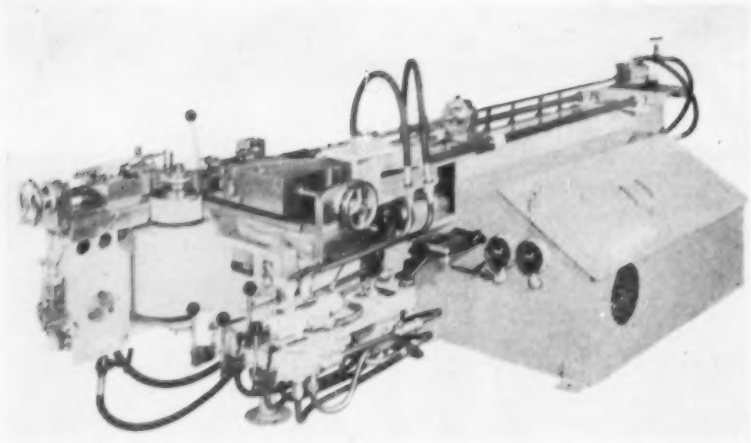
CITY_____ ZONE_____ STATE_____



## Dials Simplify Production Bending On Wallace Bending Machine

Designed primarily for aircraft work, hydraulic bending machine, of rotary type, is an automatic unit with a maximum capacity of 1-in.-OD x 0.065-in.-wall stainless-steel tubing or 1½-in.-OD x 0.065-in.-wall aluminum tubing. Designated the Consensus Bender, machine can be set up so that any inexperienced worker can duplicate specific bends from given information.

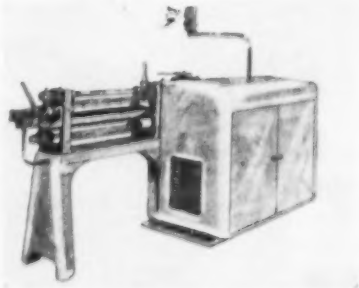
No measuring devices are needed to set up the machine. Built into the unit are micrometer positioning dials for the pressure die, clamping die, and shoe. Degree of bend is selected from a degree dial. Length gages are set from a length scale. Operator merely takes previously recorded information and sets dials to correspond.

Bending arm runs at a maximum of 15 rpm. Eight-station degree-of-bend selector is actuated by a hand knob protruding from control panel. Other specifications: mandrel clearance, 9 ft; maximum radius adjustment, 6 in.; mandrel-cylinder stroke, 4 in.; follow-die support, 12 in.; 8 adjustable length stops; 5-hp, 440v ac motor.

*Wallace Supplies Mfg Co, 1304 Diversey Pkwy, Chicago 14, Ill*

**Heavy-duty wire basket** for handling materials, Model RJ 12-20-4, features a tri-frame, arc-welded at eight points. Frame is constructed of 10-gage wire, body is welded 11-gage wire. Mesh opening is ¾ in. Container is 12 in. wide, 20 in. long, and 4 in. deep.

*Jaxon Wire Products, 1705 Probert Rd, Jackson, Mich*



WIRE STRAIGHTENER-CUTTERS are available in a line handling wire of diameters from 1/16 to ¼ in., 1/16 to 5/16 in., and ⅛ to ½ in. Machine is electrically operated with variable-speed drive, has clutch-and-trip mechanism of positive, sensitive type. Wire-catcher pan runs full length of machine, up to eight feet—*Geo C Patterson Machine Co, 3409 Trumbull St, Cleveland 15, Ohio*

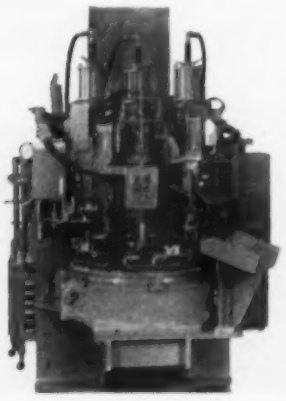
### Oil-Dyne Hydraulic Power Unit Designed to Conserve Space

Typical Oil-Dyne Powerpak unit measures less than 9 in. in height, 6 in. in length, and 4½ in. in width. Unit requires no cumbersome mounting base and may be mounted anywhere, in horizontal or vertical position. Pump may be inclined as much as 45° in any direction from vertical.

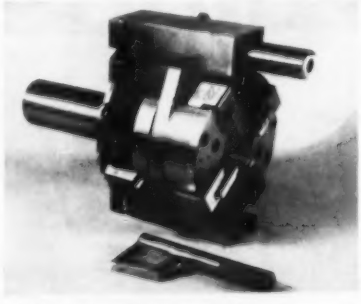
Unit consists of electric motor, high-pressure/low - volume pump, couplings, integral reservoir, automatic valving for cylinder actuation, and optional pressure switch and mounting bracket.

System is said to eliminate need for separate solenoid valves, relief valves, and reservoirs. Pressures up to 3000 psi are developed, with 5000-lb peaks. Bore cylinders of ½, ¾, 1, and 1¼ in. are available. Brochure describing units is offered.

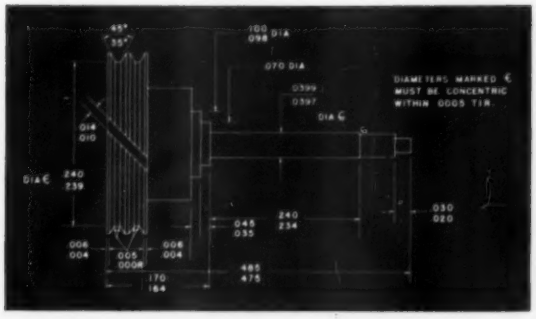
*Oil-Dyne, Inc, 2115A Marquette Rd, Chicago 36, Ill*



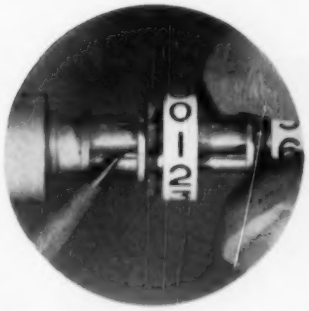
HOT UPSETTING MACHINE is used to assemble automotive door-lock cover cups which, with three tabs penetrating openings in base plate, provide outboard bearing for lock gear. Special 3-station, dual-ram resistance welder with Geneva index table is used for assembly. Ends of cup tabs are resistance heated and upset to produce strong, accurately aligned assembly—*Taylor-Winfield Corp, Warren, Ohio*



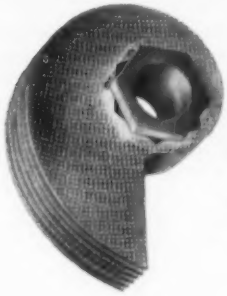
INSERT CHASER DIE HEAD, Size 1101 Style DMRT, is designed for straight, regular, taper, or reverse taper threads with only a few minutes changeover. Intended for use on No. 2 B & S automatic screw machines, head has a trip plunger cam which enables user to select type of thread desired. Capacity, depending on thread lengths, ranges up to 1 in. Device also has a pipe-thread capacity ranging from ⅛ to ¾ in.—*Eastern Machine Screw Corp, Truman & Barclay Sts, New Haven 6, Conn*




Inspection of incoming precision shafts took 10 to 15 minutes each by mechanical gaging—involved concentricity, diameters, shoulder locations, and other tough-to-measure dimensions to tolerances of .0002". Doing the work on a Kodak Contour Projector cut time to 2 to 3 minutes per shaft.



The problem was to check many small calculating machine parts averaging about 13 critical dimensions for each with shapes mostly complex. With carefully engineered mechanical gages, inspection time averaged 50 seconds each. Optical gaging on a Kodak Contour Projector brought the average down to 12 seconds.



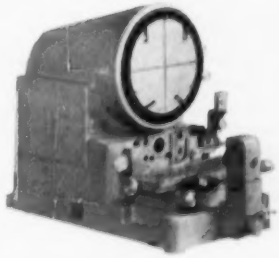
Spacing the parallelism of a special tuning condenser for electronic test equipment had to be held to very close tolerances. "Use of the Kodak Contour Projector," the company reports, "permits economical measurements of parallelism to an accuracy impossible to obtain by other methods."

On a flexible rubber-like part, rejects ran as high as 30%. By using a Kodak Contour Projector to measure the parts and then plotting results by statistical quality control methods, production changes were made that resulted in rejects dropping from 30% to less than ¼ of 1%. Optical gaging eliminated distortion of the part while gaging, and proved 4 to 5 times faster than usual methods.

# One instrument inspects these varied parts

Here is another economy optical gaging can provide: switching from one part to a second part requires only a change of chart and fixture. You still use the same basic instrument. And with a Kodak Contour Projector, the variety of parts you can check is almost without limit. Here's why:

1. *Capacity*—Screen size on an optical comparator does not restrict the size of parts you can handle, for multiple-position fixtures allow the handling of parts larger than the screen itself. What's important is the staging area—and Kodak's unique relay lens provides uniform ample clearance regardless of magnification. The distortion-free image lets you measure anywhere on the viewing screen. The choice of lenses, of horizontal or vertical projection, and of surface or shadow illumination gives you the greatest possible flexibility.
2. *Ease of operation*—Kodak Contour Projectors are designed for maximum speed and minimum operator training. The bright screen image reduces fatigue, lets you use the instrument in normal room light. Images are erect and unreversed at all magnifications. Finger-tip controls are within convenient reach of the operator.
3. *Optical stability*—The adjustment-free optical elements on Kodak Contour Projectors eliminate the need for operator adjustments. Rigidly mounted lenses and mirrors maintain alignment and position. Rugged construction withstands rough and heavy use.

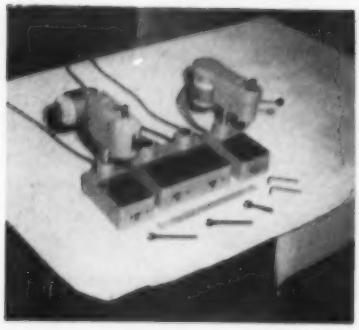


Whether you are now using optical gaging or just considering it, you should have a copy of the booklet, "Optical Gaging with Kodak Contour Projectors." It gives complete details on Kodak optical gaging equipment and how it can work for you. Write to *Special Products Sales Division.*

**EASTMAN KODAK COMPANY,** Rochester 4, N. Y.

## the KODAK CONTOUR PROJECTOR

Kodak



## Less Vibration, More Stability In Haller Drill-Tap Units

Machines designed for drilling and tapping small holes in delicate work have drive-motor frames rotating with drive pulleys to produce a flywheel effect, thereby cutting vibration and increasing stability. With pulley and motor operating as an integral massive unit and with ball-bearing construction, uniform tension is maintained on drive belts, constant speed is assured, and a high degree of precision is obtained.

Power transmission to spindles is applied by means of round-weave endless belts with means of adjusting tension. Hardened-and-ground spindle on drilling unit employs speeds ranging from 3500 to 10,000 rpm. Tapper spindle speed is 1700 rpm for tapping, with return speed of 2100 rpm. Tapping depth is controlled by an adjustable depth stop. Drilling depth is controlled by micrometer adjustments on spindle.

Drills and taps are accommodated to 0.100-in. diameter. Maximum drill depth is 25/32 in.; maximum tap depth is 45/64 in. Equipment operates from 220-v ac line.

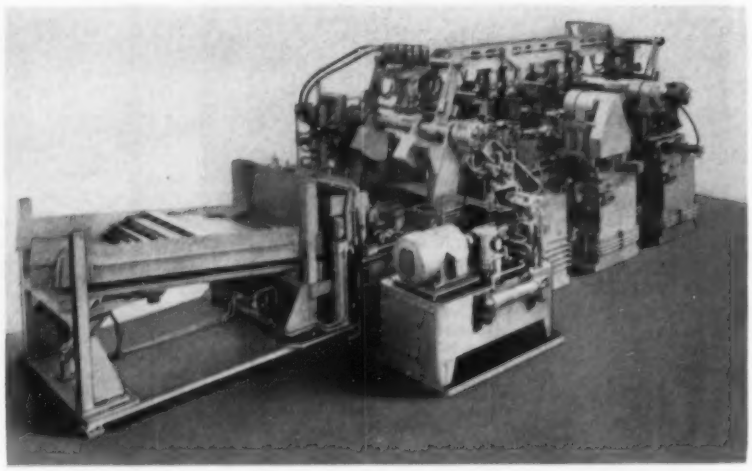
*Haller, Inc, 684 Ann Arbor Rd, Plymouth, Mich*

## Webber Rivet Cooler Offered In Portable Model

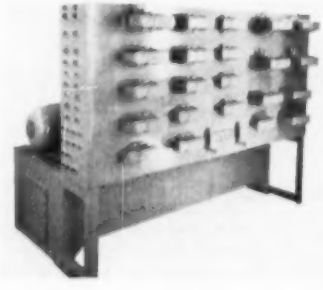
Weighing only 68 lb, 1-cu-ft rivet cooler, Model WE-1-40, requires only connection to electrical service to place in operation. Unit holds 25 aluminum canisters, each of which will hold 1 lb of 17 ST or 24 ST aluminum rivets. Maximum temperature range is –50F.

Assembly includes safety locking device which prevents access to rivets in cooler if temperature of storage chamber rises to –20 F. Hermetic-type compressor uses Freon as refrigerant.

*Webber Engineering Corp, Dept 1C-287, PO Box 217, Indianapolis 6, Ind*



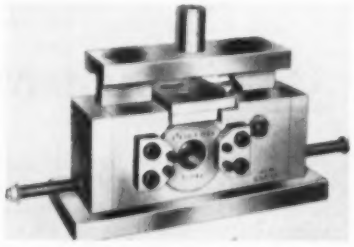
TUBULAR-STEEL STEERING COLUMNS for automobiles are machined on 5-station double-end precision boring machine, of in-line transfer type, which utilizes modular construction and a special inclined hopper-feed mechanism and overhead transfer-bar arrangement. Unit flares, faces, chamfers, and rough- and finish-bores both ends of tube at rate of 414 per hr at 80% efficiency. Machine is 24 ft long, is supplied with hydraulic power by a separate power pack with 10-hp motor—*Expert Automation Machine Co, 17144 Mt Elliott Ave, Detroit 12, Mich*



POWER UNIT designed for special planetary milling machine includes one single and two double Dudco vane pumps, driven by a 7½-hp single-end motor. Reservoir capacity is 200 gal. Complete installation meets JIC standards. Unit powers machine which automatically machines valve bodies up to 10 in. in dia, finishing three flanges at once—*J N Fauver Co, Inc, Hydraulic Div, 51 W Hancock, Detroit 1, Mich*

**Mold-release liquid** designated Type R-2 contains special combination of chemicals in addition to its basic ingredient, called Vinium. Applied in liquid form, it dries quickly to produce a hard, smooth, glossy surface that inhibits affinity of plastic for mold. Available in hand-held spray can and in several sizes of bulk containers, liquid is clear, will not discolor plastics.

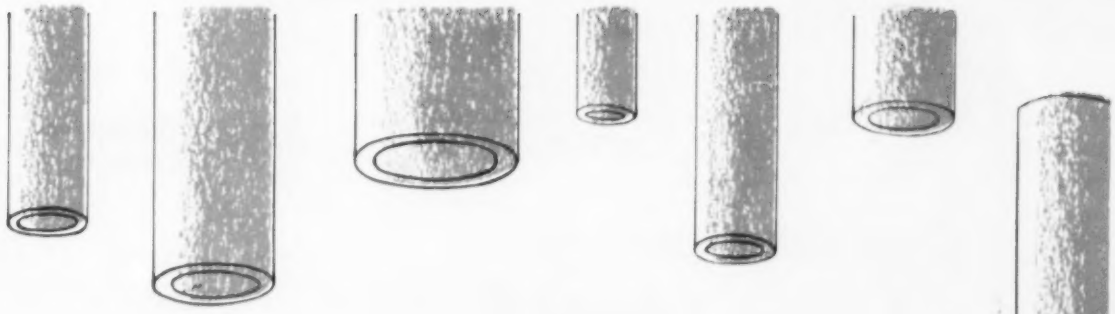
*Vin-Rock, Inc, 8211 Almira Ave, Cleveland 2, Ohio*



PIPE AND TUBE NOTCHER called Arc-Twin cuts from the inside out, leaving clean edges that require no further finishing. Reciprocal action of punch cuts two identical notches with each downstroke of punch press, an operation said to take only two or three seconds. Notches are aligned 180° apart—*Vogel Tool & Die Corp, 1825-1 N 32nd Ave, Melrose Park, Ill*

**Holders for throw-away inserts** use standard diamond-shaped D-55 inserts in company's line, and are available in three types: right hand (DAR), left hand (DAL), and centrally (MX-8-T5C). DAR and DAL holders are reported suitable for plunge turning and facing operations. MX-8 type is designed for such machines as the New Britain copy lathe. Inserts have four sets of cutting edges to which they can be progressively indexed before tip is discarded.

*Wesson Co, 1220 Woodward Hts Blvd, Ferndale 20, Mich*



# See how much YOU will save when you buy ASARCON BEARING BRONZE in the exact length you need

If you're buying standard 13-inch bronze bars, you have a remnant problem; and that's expensive!

Prove it to yourself. Take your pencil and fill in the blanks below:

**TOTAL LENGTH OF PARTS FROM 13" BAR STOCK** _____

**LENGTH OF SHORT END SCRAP** _____

**WEIGHT PER INCH OF BAR STOCK YOU USE** _____

**WEIGHT OF SCRAP PER 13" BAR** _____

**COST PER POUND OF BRONZE YOU USE** _____

**COST OF SCRAP PER BAR** _____

Now multiply the cost of your scrap by the numbers of bars you use per month and you can see how much short-end scrap is costing you.

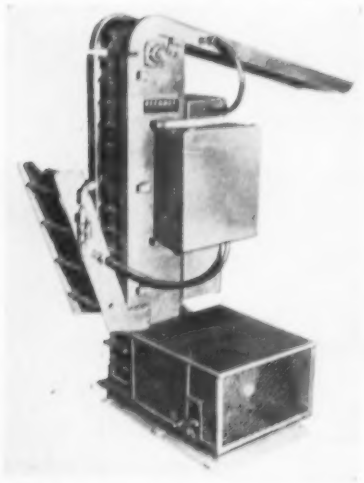
If you want to save this money, buy Asarcon Bronze rods, tubes and shapes in exactly the length you need up to 105"; and in any diameter up to 9". Talk to your nearby Asarcon distributor, or write to us directly. We'll be happy to show you how other companies are turning bronze scrap-end losses into profits.

**Continuous-Cast Products Department**

**AMERICAN SMELTING AND REFINING COMPANY**

**Perth Amboy Plant, Barber, New Jersey • Whiting, Indiana**
**WEST COAST SALES AGENT: Kingwell Bros. Ltd., 457 Minna Street, San Francisco**
**IN CANADA: Federated Metals Canada, Ltd., Toronto and Montreal**

ASARCO



## Feedall Elevating Conveyor Handles Long Cylindrical Parts

Special Model 4000 accepts long cylindrical parts in a rolling position from discharge chute of one machine, elevates them, and then delivers them to next machine in production line. Unit operates at a delivery rate adjusted to that of the second production machine and is equipped with a bank control which shuts off the first machine if it is feeding too fast.

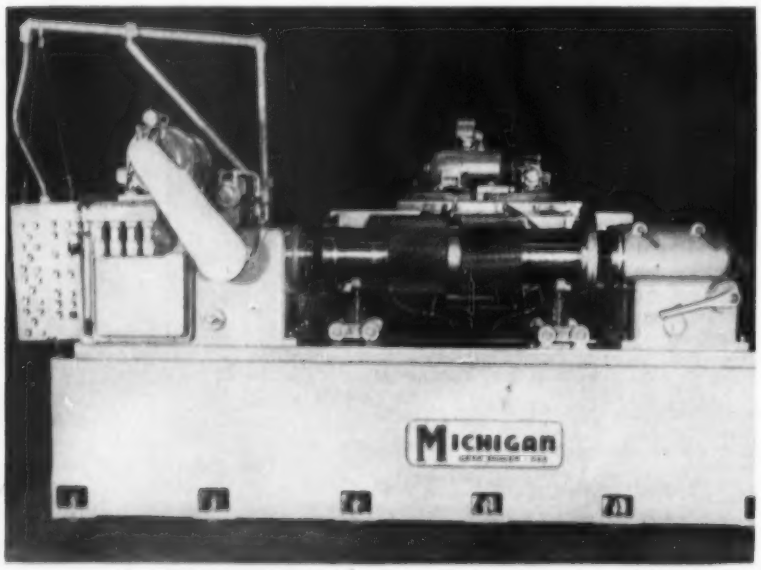
Conveyor will handle cylindrical parts from ⅜ to 1¼ in. in diameter and up to 12 in. long. Power is furnished by a ¼-hp, 220/400-v motor through a variable-speed drive. Unit can be modified to meet individual requirements.

*Feedall, Inc, Willoughby, Ohio*

SEQUENCE VALVES for controlling sequencing-type air circuits, Types TD and WV, provide for a pre-set pattern of operations to be automatically carried out by a machine after operator initiates cycle. Cylinders can be sequenced by position or time, and their action interlocked in the circuit. Available models include straightways and threeways, normally opened or normally closed, and four-ways. They are provided for base mounting or in-line mounting, in sizes from ¼ to 1¼ in.—*Ross Operating Valve Co, Detroit, Mich*

AIR-OPERATED ROTARY GRINDERS, Models 3G and 3GE, are available in five versions, based on motor speeds of 7, 10, 12, 15, and 18-thousand rpm. 3GE is offered at 18,000 rpm only, and features a tapered extension spindle support which extends approx 3 in. beyond spindle of the 3G Series. 3G grinders weigh less than 3¾ lb., and operate on 90 psi. Features include automatic head oiler, built-in muffler, and adjustable governor. Tool illustrated operates at 12,000 rpm and has a 2½-in. wheel capacity—*Thor Power Tool Co., Aurora, Ill.*

WET DRUM MAGNETIC SEPARATOR termed WPD is designed for the efficient recovery of media in heavy-density operations. Specially designed magnet provides correct flux distribution for transportation of collected magnetic material to the discharge point. Alnico permanent magnets are used, so that no external energization is required. Bulletin 87—*Stearns Magnetic, Inc, Milwaukee, Wis*




SPECIAL SHAVING MACHINE designed for finishing large pinions can shave a gear located any place on a 100-in. shaft. Dual shaving cutters can be used to reduce machining time when pairs of gears are located close together, as shown in illustration. Operator has fingertip control by means of 32 pushbuttons on pendant control. Special hydraulic lift jacks are available for moving work into position for machining—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich*

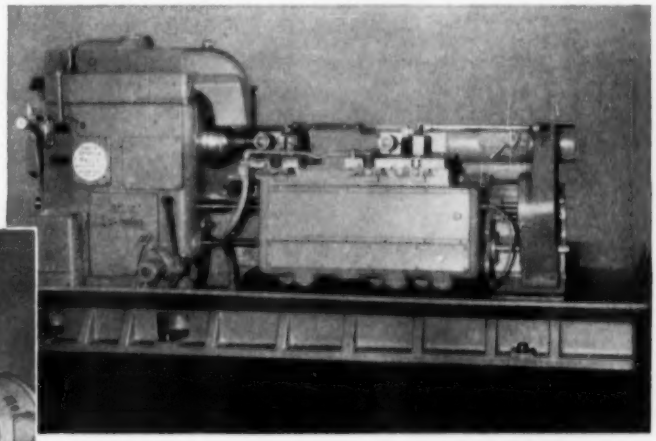
**Metal solder** designed for soldering applications where chemical surface cleaning is normally difficult contains a highly activated resin flux that will remove tough surface oxides from most common metals. Flux does not throw off objectionable odors or fumes to annoy operator, nor will it boil away or char under excessive heat. Residues can be left on joints without damage, but can also be removed easily if desired. Solder is available in 1-, 5-, and 25-lb spools in diameters from 0.020 in. and up.

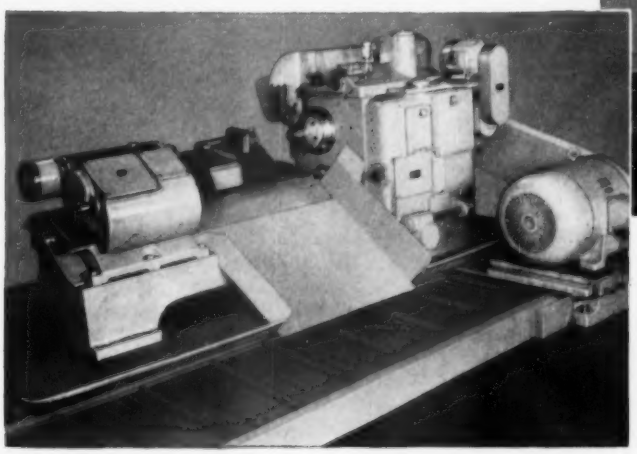
*Anchor Metal Co, Inc, 24½ Boerum St, Brooklyn 6, NY*

# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

## NEW SENECA FALLS DESIGN SOLVES CHIP DISPOSAL PROBLEM





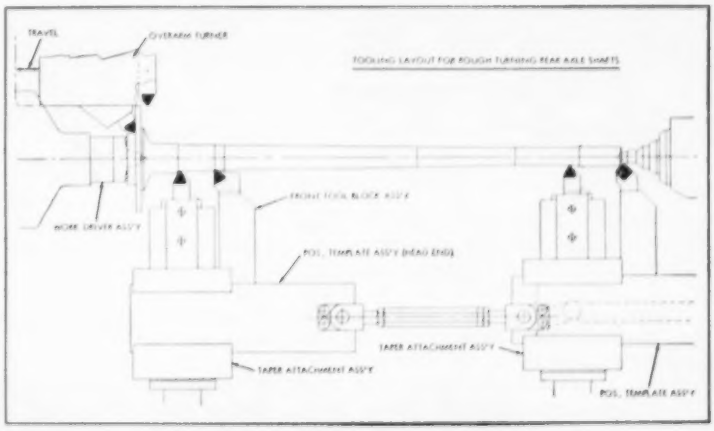
**PROBLEM:** To eliminate machine down time due to chip accumulation in the tooling area and pan of lathes required for a high production rear axle shaft job.

**SOLUTION:** To promote rapid flow of chips from the edges of the cutting tools, Seneca Falls engineers designed a special "Chip Flow" type bed for the otherwise standard Model AR Automatic Lo-swing Lathe.

The rear view illustration shows that the usual back shelf has been eliminated in the chip area and replaced with a smooth, steep angle slope which assures an uninterrupted flow of chips from the edges of the cutting tools into the mechanized chip conveyor at the base of the machine. Auxiliary attachments are mounted overhead instead of on the usual back shelf. An auxiliary, cam-operated turning slide mounted on the headstock is used for turning the outside and pilot diameters of the shafts. Facing slides can be supplied to replace this attachment.

High spindle speeds and coarse turning feeds assure a production of 153 shafts per hour with Automatic Work Handling Equipment.

**SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.**




**PROFIT ENGINEERED BY SENECA FALLS**

## National Pioneer Honing Machine Offers Automatic Cutting Speeds

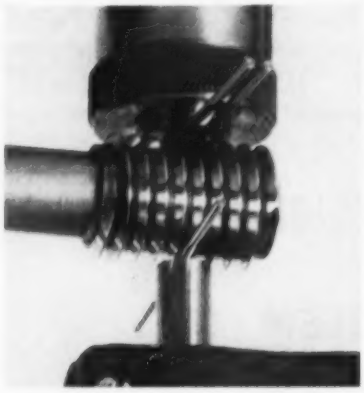
Model S-6 horizontal honing machine incorporates limit switches to control both honing of part and complete usage of honing stone. Variable-speed motors provide speeds from 100 to 1600 rpm.

Automatic cutting speeds start with a low rpm for roughing; when work is within a predetermined ten-thousandth of finish size a high rpm automatically takes over to assure a low micro finish. Automatic sizing ends the honing cycle, also permits operator to explore bore visually during operation. Stone pressure is also automatic, as well as stone "feed-up."

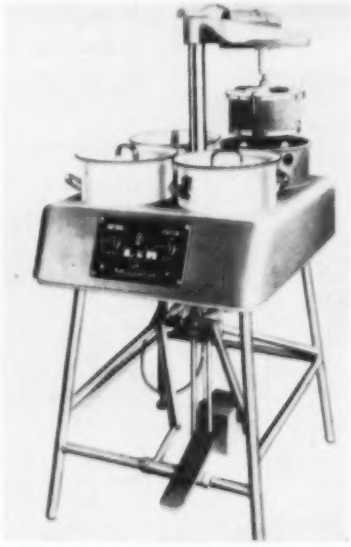
Optional equipment includes automatic air-gage sorting of parts if required.

*National Pioneer, Inc, Box 668, Muncie, Ind*

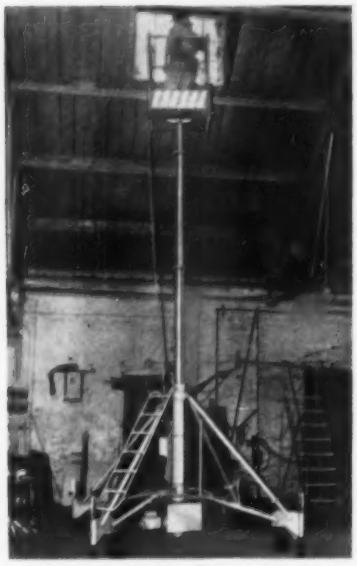
TROLLEY CONVEYOR, Series T-100 in Chain-O-Flex line, is designed for operations on 3-in. I-beam or 2½-in. T-beam for conveyor jobs in ovens, spray booths, or dips. Trolley capacities range from 80 to 160 lb, and can be doubled by use of load bars. Series is reported practicable for operation in temperatures to 350 F. Wide variety of curves and trolley spacings is offered—*Chain-O-Flex Corp, 3334 Lincoln Ave, Franklin Park, Ill*



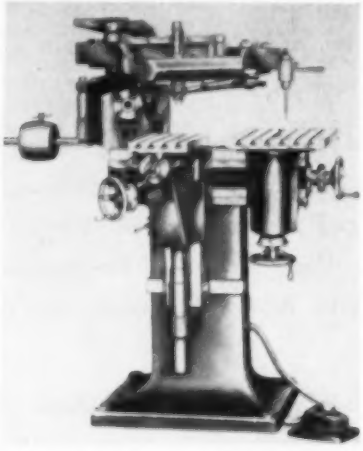
THREAD - MEASURING WIRES for standard 60° Unified and American threads are calibrated, in addition to being furnished within 0.00002 in. of nominal best size. Individual calibration of each set of wires permits more exact computation of the wire constant, which is printed on label accompnaying wires. Photo illustrates three-wire method of measuring thread gage—*Van Keuren Co, Watertown, Mass*



PARTS-CLEANING MACHINE called Monarch weighs 200 lb, is 55 in. high, and covers area of 28½ x 25 in. Basket size is 8 in. in diameter by 4½ in. deep, and capacity is 225 cu in. To segregate varieties of small parts, a triple nesting basket fits into work basket. Machine can be applied to quantity cleaning, rinsing, polishing, and drying of small parts—*L & R Mfg Co, 577 Elm St, Arlington, NJ*



MOBILE ACCESS LIFTS are available in six models with maximum reach of from 19 to 42 ft above floor. Hydraulically operated units have pushbutton control on platform's guardrail for raising, lowering, and stopping. Stability is assured by leveling jacks at each corner. Platform is 2 ft 3 in. square, will hold 350 lb, and can be rotated through 360°—*Ballymore Co, Wayne, Penna*



3-D PANTOGRAPH ENGRAVER, Pear Model PF-2, is an Italian machine used for mold making and also for two-dimensional engraving and routing. The various pivots are supported in special roller bearings. Standard equipment includes ½-hp motor, controls, assorted styli, and cutters—*Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY*

## Ask the man who hones one

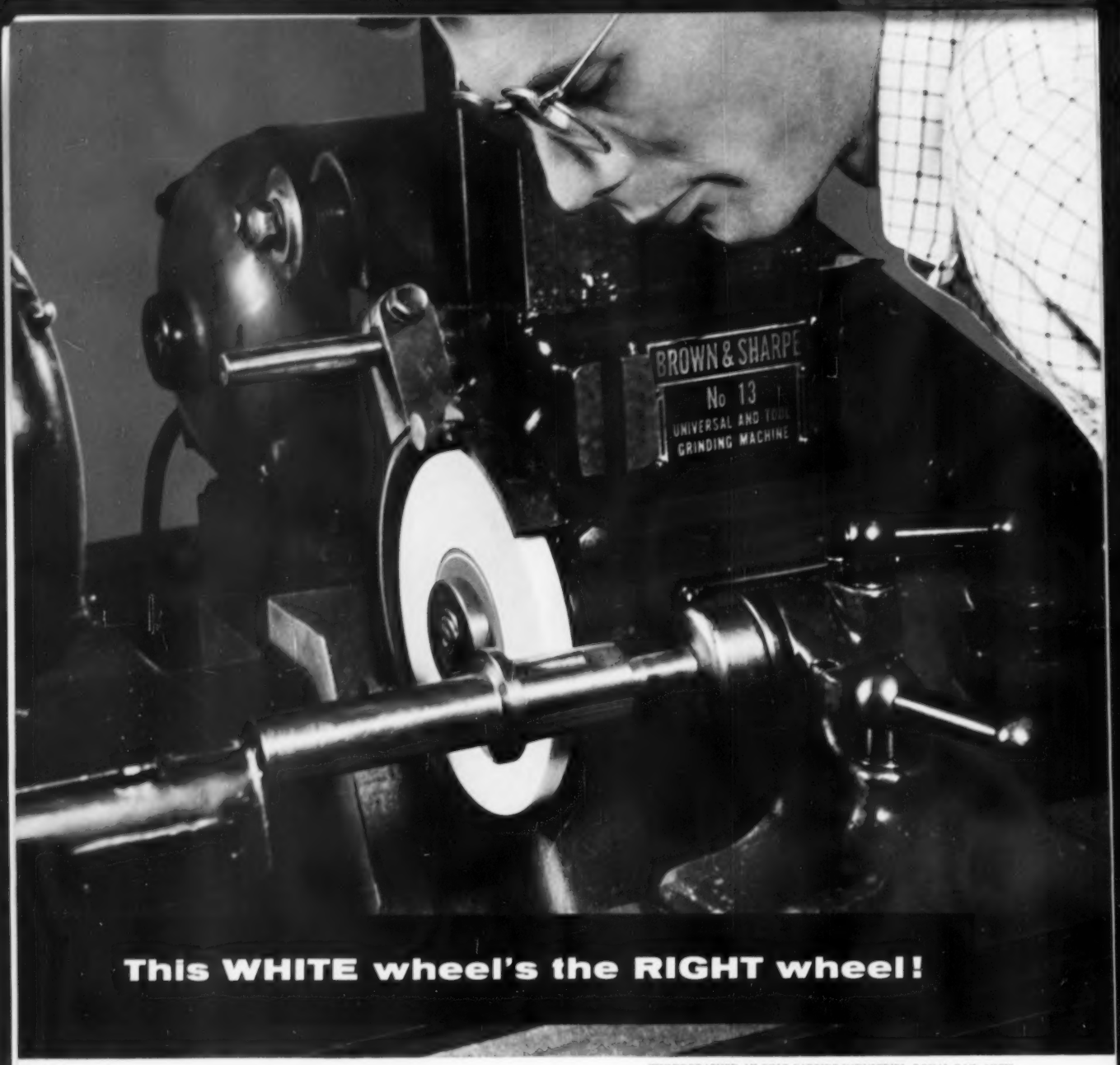
Want finer, more uniform finishes on intricate metal parts like these, at less abrasive cost? Standardize on Tumbling Grains by CARBORUNDUM in your barrel finishing operations. Each particle — of fused aluminum oxide — is tough and blocky. Used in modern precision tumbling machines, they produce a continuous honing action that combines rapid stock removal with the generation of ultra-fine finishes. CARBORUNDUM's Tumbling Grains are designed for both wet and dry operations, on metal parts of almost any size or shape. These Tumbling Grains come in a wide variety of sizes. They are sometimes used as an additive to other tumbling media. Get all the facts from your CARBORUNDUM Distributor or salesman. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

**Through application "know-how" and product quality**

# CARBORUNDUM

REGISTERED TRADE MARK

**continually puts more sense in your abrasive dollar**




## This WHITE wheel's the RIGHT wheel!

PHOTOGRAPHED AT COLE CARBIDE INDUSTRIES, ROYAL OAK, MICH.

If you're after greater precision, production and economy in your tool room grinding, change to "V40" Bond Wheels by CARBORUNDUM. The sharp, white aluminum oxide grain cuts exceptionally free and cool, even on high speed tool steels. You can take heavier infeeds without burning the work...and still get a better finish. The stronger vitrified bond makes "V40" wheels last longer, without costly downtime for dressing midway through a job. "V40" wheels come in the *right* types, sizes and gradings for *every* tool room job. Call your CARBORUNDUM Distributor or salesman for a free demonstration in your shop. For your copy of Bulletin A-1310, giving actual "V40" case histories and recommended gradings, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

**Through application "know-how" and product quality**

# CARBORUNDUM

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**continually puts more sense in your abrasive dollar**

# OILITE

## parts in power saw resist wear better than steel and cost less

*Another cost-saving application of* **Amplex Powder Metallurgy**

With a modern power saw—easy does it. It's easier on the inside, too, because this manufacturer has equipped vital components with extra tough, greater wear resistant OILITE precision parts. The manufacturer's report indicates that OILITE powder metal sprockets and gears offer *greater wear resistance than alloy steels.*

Furthermore, in using OILITE precision parts the manufacturer of the power saw realizes *substantial cost savings over parts fabricated by any other process.*

What this manufacturer is accomplishing with OILITE precision parts, you can too. Or, perhaps, in your case OILITE self-lubricating bearings and bearing materials can help you lick the problem of providing lubrication in hard-to-get-at places. In permanent metal filters, too, OILITE provides a wide choice of shapes, sizes and porosities to meet product requirements.

Amplex—volume producer of Chrysler-engineered powder metal components—can meet your production schedules with on-time deliveries in any quantity.

Helping solve the problem of others is a daily occurrence at Amplex. This Chrysler-Amplex engineering service is available to you too.

*Representatives and dealers located in principal cities in United States and Canada.*

A CHRYSLER OILITE PRODUCT

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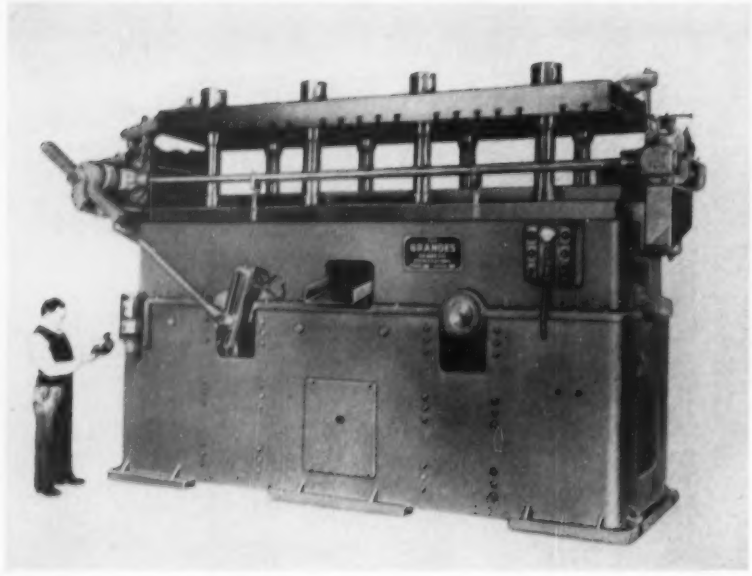
*New 52-page OILITE Engineering Manual. Supplies valuable engineering data and application information on OILITE powder metal bearings, parts and filters. Ask for Manual E-56. Write: Dept. S.*

**Bearings • Finished Machine Parts • Permanent Metal Filters • Friction Units**



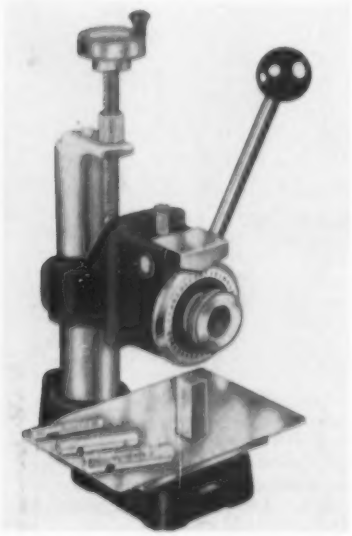
AUTOMOTIVE HEADLAMP ASSEMBLIES are turned out at a rate of 1800 per hr on special 450-ton press, which weighs 175,000 lb and has been designed to handle progressive dies up to 34 in. wide and 160 in. long. Machine is 11 ft high and 16 ft long over-all. Production speeds are 15 to 30 spm—*Brandes Press Co, Cleveland, Ohio*

## Two-Station Machine Deburrs, Chamfers Gears or Splines

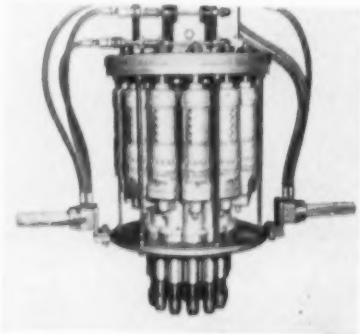
Developed for the simultaneous deburring and chamfering of both sides of gears or splines, two-station Duplex Burr-Master has output rate of up to 5 teeth per sec with spur gears, helical gears, and straightsided or involute form splines. Model BMED-24 has work range from 0.625 to 6.5-in. PD; Model BMED-29 handles work from 3 to 9.5-in. PD.

Depth of chamfer is infinitely adjustable. Work cycle is automatic, and electric clutch stops machine with cutters withdrawn for loading and unloading. Separate motors and controls are supplied for each work station. Two 1-hp, 1200-rpm, 220/440-v ac motors are used.

*Modern Industrial Engineering Co, 14230 Birwood Ave, Detroit 38, Mich*



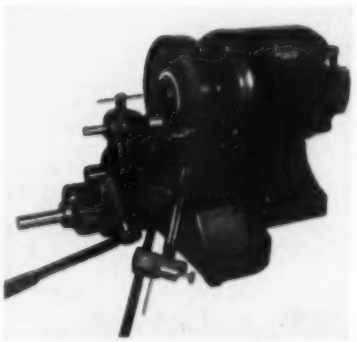
PARTS-MARKING PRESS stamps parts from 1/32 to 4 in. thick, has 4-in. throat depth and 8 x 10-in. table. After part is clamped to table, rest of operation is mechanical. Steel dial marks work when handle is pulled forward; after each stroke the table spaces automatically in position for the next character. Depth of impression is controlled by stop on top of machine. Automatic spacing mechanism uses 110 ac—*Clearview Co, 172 Stanton St, New York 2, NY*



TWELVE-UNIT NUTSETTER is designed to tighten simultaneously a dozen nuts to pre-determined torque. Special unit features offset spindles, arranged in a compact 6⅜-in. working circle, and was built for setting automotive differential-housing nuts—*Thor Power Tool Co, Aurora, Ill*

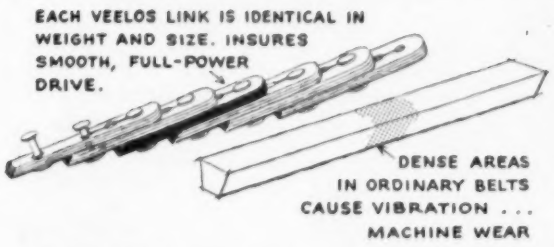
**Heavy-duty fan**, Chelsea type PLF, is designed for industrial applications where static pressure is greater than ⅛-in. and where dirt, dust, smoke and steam are prevalent. Unit comes with square frame and totally enclosed, ball-bearing motor in ratings of ¼ to 7½ hp. Models are available to deliver from 2900 to 37,500 cfm.

*Chelsea Fan & Blower Co, Inc, 639 South Ave, Plainfield, NJ*

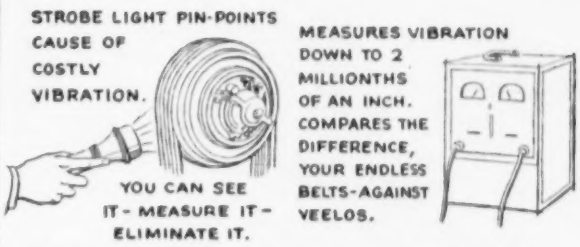


DRILL GRINDER, Model DG-3, will sharpen all drill sizes from ⅛ to 1¼ in. Unit has all adjustments calibrated on the machine, insuring proper heel clearance, web angle, and cutting-lip angle. Requiring no additional adaptors, accessories, or fittings, unit is said to be able to handle most types of drills—*Lisle Corp, Clarinda, Iowa*

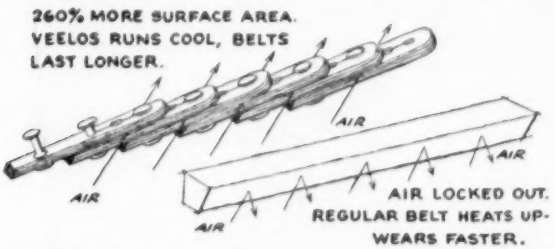
# Six Reasons Why Veelos Adjustable V-Belts Are Better For Your Drives!


EACH VEELOS LINK IS IDENTICAL IN WEIGHT AND SIZE. INSURES SMOOTH, FULL-POWER DRIVE.
DENSE AREAS IN ORDINARY BELTS CAUSE VIBRATION . . . MACHINE WEAR

**1. Balanced construction** of Veelos Belts assures you faster, cleaner work, less rejects . . . less bearing wear. Each link and stud is identical in size and weight. Ordinary belts have varying spots of density which cause excess vibration—chatter marks, machine wear.


STROBE LIGHT PIN-POINTS CAUSE OF COSTLY VIBRATION.
YOU CAN SEE IT - MEASURE IT - ELIMINATE IT.
MEASURES VIBRATION DOWN TO 2 MILLIONTHS OF AN INCH. COMPARES THE DIFFERENCE, YOUR ENDLESS BELTS-AGAINST VEELOS.

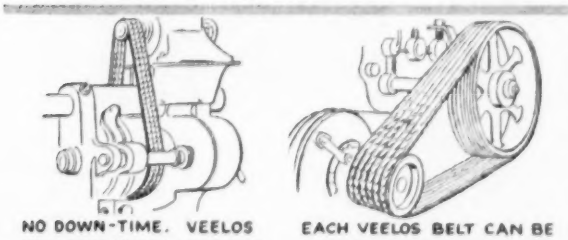
**2. Electronic proof**—up to 90% less vibration! With a vibration analyzer, you see, on your own machine, how Veelos belts decrease vibration up to 90% over any belt you're now using. This amazing Veelos test pin-points the belt that has the "invisible shakes."




**3. Cooler running—long life!** Veelos breathes! Constant circulation of air keeps Veelos running smooth. Regular V-belts have no chance to cool, heat builds up from the inside . . . causes slippage, wastes power, heats bearings, reduces belt life.

AREA CONTACT
POINT CONTACT
PERFECT VEELOS FIT. EXTRA THICKNESS AND MACHINE-CUT SIDES PREVENT BOTTOMING. MEAN CONSTANT POWER.
POWERLESS POINT CONTACT OF ORDINARY V-BELT. BULGES, SLIPS, CAUSES UNEVEN SHEAVE WEAR.

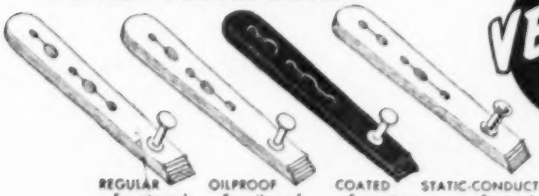
**4. Greater flexibility** reduces slippage! Sectional construction, beveled links allow greater flexibility, longer belt life. Each link moves around sheave independently and maintains full contact, constantly. Full area contact allows shorter centers, smaller sheaves.


NO DOWN-TIME. VEELOS FITS ANY DRIVE - WITHOUT DISMANTLING.
EACH VEELOS BELT CAN BE ADJUSTED - NO NEED FOR EXPENSIVE MATCHED SETS.

**5. Simple installation** "knocks out" down-time! Saves up to 50% installation time on outboard bearing drives, more when belt length isn't in stock. No resetting, tilting or moving motors. Veelos can be made any length, can be changed by adding or removing links.

**6. Veelos won't stretch** any more than ordinary endless V-belts when it is properly installed. *Remember—measure Veelos 1" short per foot and roll on drive as tightly as possible.* With the first few revolutions Veelos studs accept a permanent set into the sections they connect.

**4 TYPES—FOR ALL DRIVES**


REGULAR For general service
OILPROOF For oily and hot drives
COATED For wet or oily drives
STATIC-CONDUCTING For explosive atmosphere

VEELOS
THE BALANCED LINK V-BELT
Known as Veelink outside U.S.A.

**For all sizes and types of drives. Double-V available for serpentine drives.**

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**MANHEIM**
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## Spitfire Lapping Machine Achieves 2-rms Flatness

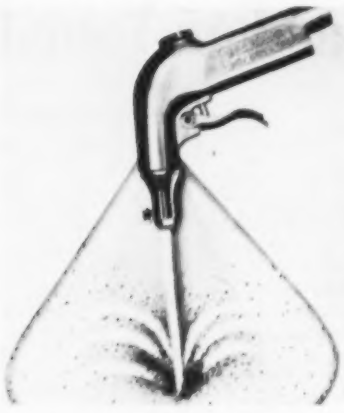
Model 18 lapping machine, with an 18-in.-dia lapping plate, is designed to produce micro-inch finishing for small and medium-size parts such as gages, sliding and rotating members, air- and liquid-tight seals, and valves. Machine is reportedly capable of finishing to optical flatness of 2 rms or finer.

Set-up time is greatly reduced, because no collets, chucks, or holders are used. Lapping plate is constructed of close-grained cast iron heat-treated to prevent distortion and machined to fine accuracy. It is supported by six hardened-and-ground, permanently sealed ball bearings, mounted on eccentric bushings which permit uniform adjustments. Large door in base provides easy accessibility to motor and gear box.

*Spitfire Tool Co, 2931 N Pulaski Rd, Chicago 41, Ill*

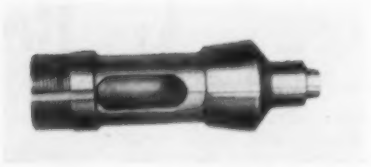
**Malfunction detector,** Vibraswitch Model 5, is a vibration monitor which anticipates and prevents trouble in rotating and reciprocating machines by responding to slight increases in roughness or vibration and automatically causing a shutdown before failure occurs. It may be used singly on small equipment, in pairs on driving and driven equipment, or in series or parallel combinations to monitor such parts as bearings. Acceleration range is 0 to 2 g's to cover all types of rotating equipment at speeds to 18,000 rpm. Unit has no vacuum tubes or electronic components, is maintenance free.

*Beta Corp, Forest Ave at Ridge Rd, Richmond 26 Va*



SAFETY AIR GUN called Guardair is used for blowing dust or chips from work in progress. Device uses central jet of air to blow away debris; at the same time, a second jet provides a protective shield of high-pressure air which prevents debris from flying upward into operator's face. Gun attaches to shop air line, is operated by trigger—*Hydraulic Mfg Co, Kiel, Wis*

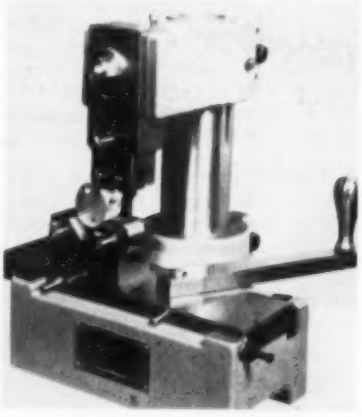
PINTYPE ARBOR designed to facilitate machining of gears with involute splined bores is reported to speed loading, locking, and unloading work. No arbor press is required, and no nuts or wrenches are needed for locking work on arbor. In operation, work is loaded, then rotated to actuate the arbor; this action moves pins up internal cams, forcing them into line contact with adjacent splines at, or near, the pitch line. Part is locked firmly to arbor, with pins applying equal force all around the splined bore to eliminate play—*Scully-Jones & Co, 1901 S Rockwell St, Chicago 8, Ill*



## Erickson Expanding Mandrel Offered in Machinable Version

Known as the Expanding-Collet line, expanding mandrels can grip in a hole as small as ⅛ in. A one-piece unit which acts as a reversed collet, gripping work on the inside surface, device is machined to size on the customer's equipment for greatest possible accuracy. Thus mutiple mandrel sizes can be obtained from one basic size.

*Erickson Tool Co, E 23rd & Hamilton Ave, Cleveland 14, Ohio*

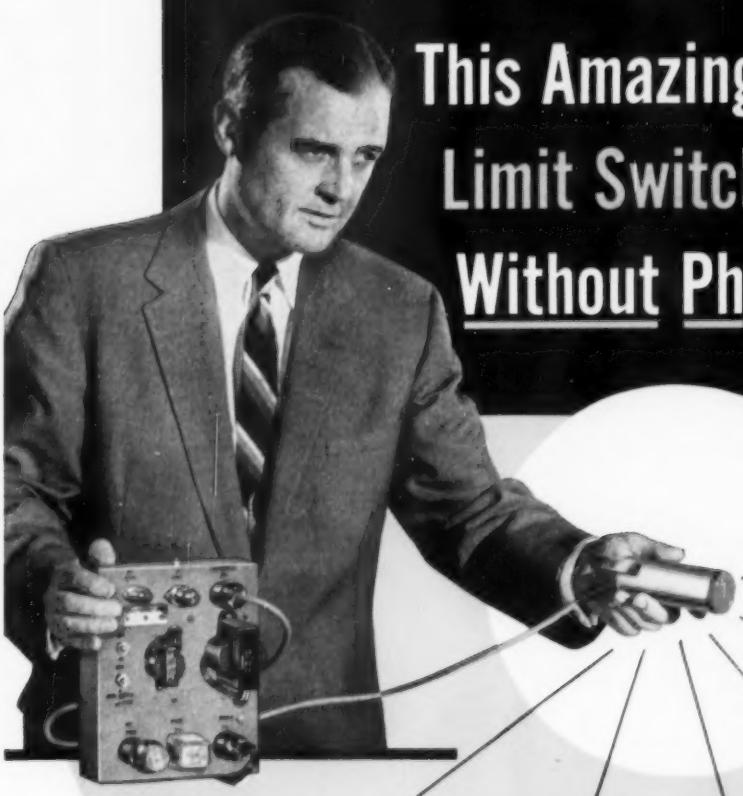


BENCH-MODEL MARKING MACHINE Model 420 is intended for the permanent marking of either round or flat work which does not require the pressure or size capacity of heavier floor-model markers. Unit has a hand-operated work slide and a rigid die-holder head which is vertically adjustable on a round column. Die slide has a dovetail slot which accommodates standard holders. Tooling illustrated shows a roller-cradle fixture which supports work and permits rotation during marking—*Noble & Westbrook Mfg Co, East Hartford, Conn*

**Liquid sealing compound,** called Slic-Seal, a dispersion with a Teflon base, helps eliminate galling of pipe threads and acts as a thread sealant. It has many other uses in the laboratory and is inert to all common chemicals. List price is $2.50 a bottle.

*Hoke, Inc, 199 South Dean St, Englewood, NJ*

# This Amazing New Limit Switch Operates Without Physical Contact!



Transducer (sensing head) is actuated by presence of magnetic materials over a wide range of sizes, shapes, weights, roughness, speeds

No moving parts. No metal-to-metal contact required for operation

Sensitivity up to 1 inch

Can be mounted in any position. Not affected by vibration

Small size (1⅞" x 6") Fits into tight spots

Non-magnetic material between the part and transducer does not affect operation

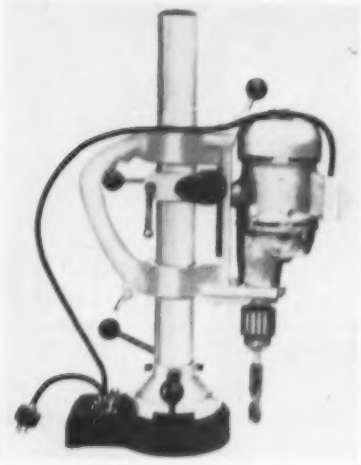
• Here's an entirely new concept in industrial limit switches! We've named it the **PROXIMITY LIMIT SWITCH** because it is actuated by the nearness of ferrous parts or materials. Since its operation requires no physical contact, it has unlimited applications in places where the use of conventional limit switches is either impractical or impossible! Its range of application is broadened, too, because the transducer (sensing head) is not affected by vibration or by the presence of non-magnetic material.

In paint spray systems, on production line presses, multiple process machines, heavy automation equipment—there are literally scores of places where this amazing new PROXIMITY SWITCH will do the job better!

**ASK YOUR SQUARE D FIELD ENGINEER FOR A DEMONSTRATION. OR WRITE FOR PROXIMITY LIMIT SWITCH BULLETIN. ADDRESS SQUARE D COMPANY, 4041 NORTH RICHARDS STREET, MILWAUKEE 12, WISCONSIN**

***NOW...EC&M* PRODUCTS ARE A PART OF THE SQUARE D LINE!**

**SQUARE D COMPANY**

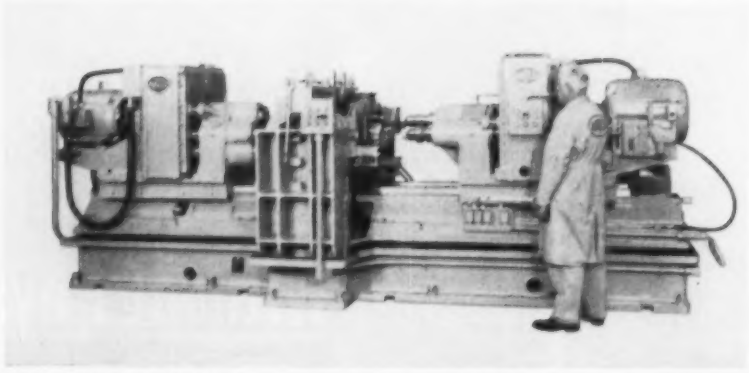


## Portable Drillpress Has Electro-Magnetic Base

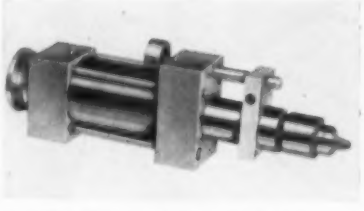
Mag-Tool drillpress with electro-magnetic base can be attached magnetically to ferrous surfaces for on-the-spot drilling, tapping, reaming, and other operations. Operating in any position, unit drills holes up to 2 in. in diameter.

Tool weighs only 45 lb, requires only one operator. Micrometer adjustment enables operator to move drill bit for precise positioning after the magnetic base has been locked in place.

*Magnetic Tool Corp, 1955 Lafayette St, Santa Clara, Calif*



TRANSMISSION HOUSINGS are machined on special two-way automatic boring machine, which produces up to 35 parts per hr. Unit, which employs hydraulic feed, has a fixture designed to hold five different housings. Operations performed in addition to close-tolerance boring are chamfering, counterboring, and notching boss contours—*National Automatic Tool Co, Inc, Richmond, Ind*

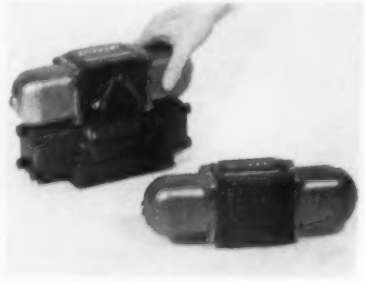


## Small Pneumatic Drill Unit Offered by Alkon

Available in strokes of 1½, 3, and 6 in., Model 150 drill unit is rated at ½-in. capacity in steel and operates at 9000 rpm maximum. Over-all dimensions are 2⅛ in. wide by 3¼ in. high by 8 11/32 in. long.

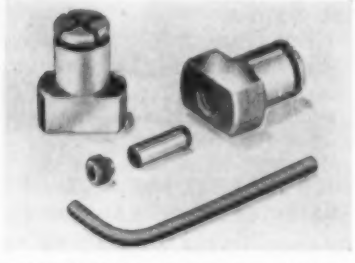
Prices are $97.50, $135, and $175, depending on stroke.

*Alkon Products Corp, 200 Central Ave, Hawthorne, NJ*



SOLENOID-CONTROLLED VALVES in DG-5 Series are improved models in company's line of piloted-operated valves. Type combines solenoid-operated pilot valve and directional valve in a wide variety of combinations suitable to almost any directional control requirement. Improvements over earlier models include over-ride plunger which permits manual operation of valve, easier wiring and installation, and addition of a solenoid cover chain —*Vickers, Inc, Detroit 32, Mich*

PARTS CONTAINER called Ready Count is a rigid metal box with a transparent sliding front panel. Five different sizes are offered. Containers can be grouped in a number of arrangements, equipped with wooden containers which hold varying numbers of units, and furnished with single- or double-tiered chutes which attach to bottom of containers for delivery of parts to operator—*Alden Systems Co, Alden Research Center, Dept 11, Westboro, Mass*

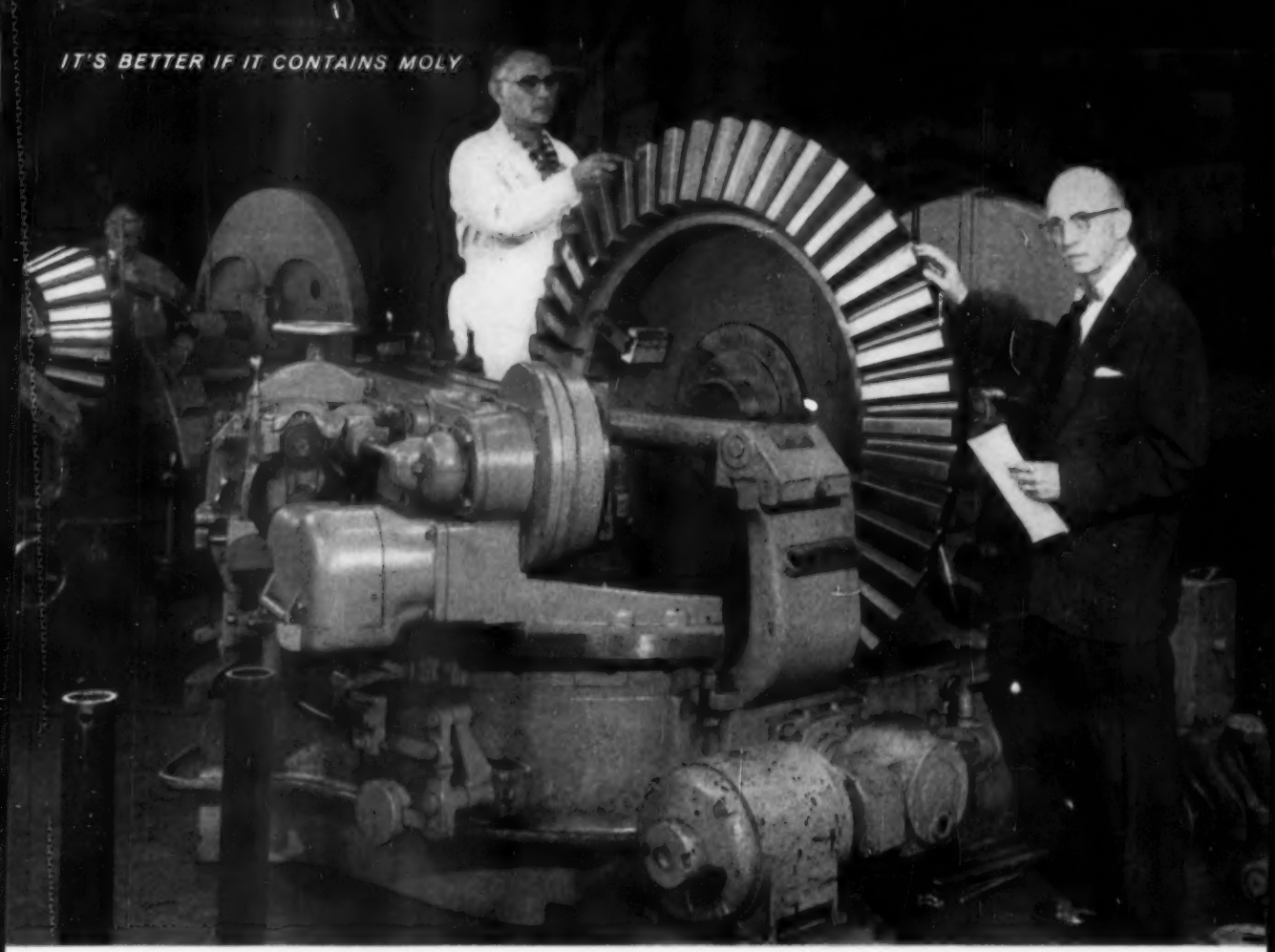


SINE FIXTURE KEY is said to eliminate five operations in milling fixture key slots. Stemmed construction requires a bored hole instead of the standard milled fixture key slot. Devices are interchangeable and are complete with self-contained locking device. Folder SKF—*Jergens Tool Specialty Co, 712 E 163rd St, Cleveland 10, Ohio*

**Copper-clad aluminum**, called Alcupal, is available in ratios ranging from 90/10 to 50/50 for single-clad and from 10/80/10 to 25/50/25 for double-copper-clad aluminum sheets. Any temper from "soft" to "1/1 hard" can be applied. Product has all the machining qualities of aluminum, and can be buffed, chrome-plated, copper-plated, drawn, stamped, spun, and formed. It can be soft-soldered on the copper-clad side, thus eliminating costly labor to attach leads to the aluminum surface.

*Standard Ore & Alloy Corp, 120 Wall St, New York 5, NY*

IT'S BETTER IF IT CONTAINS MOLY



E. B. Smiley, Metallurgist for Illinois Gear & Machine Co., looks over setup of large, heavy duty bevel gear made from molybdenum alloy steel casting. This gear has been rough turned, rough cut and heat treated to 269 to 302 Brinell before finish cutting.

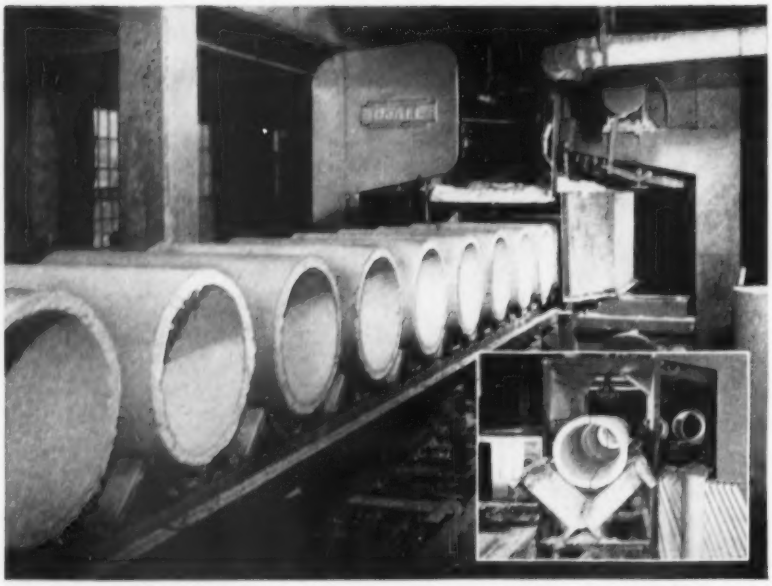
# For Strength, Hardness and Machinability gear maker recommends Molybdenum Alloy Steels

**"All of our gears are made to customer specifications, and in many cases these include the use of molybdenum steels," says Mr. Smiley, metallurgist for Illinois Gear & Machine Co. "When our customers specify heat-treated gears of plain carbon steel," Mr. Smiley continues, "we often recommend that they change to 4140 alloy containing molybdenum to achieve high strength and hardenability with good machinability."**

Moly steels offer gear users many advantages over carbon steel. Their greater strength and toughness permit the use of smaller weight-saving gears to transmit a given amount of power. Reduced weight and size of gear housings and other components add to the economy of moly steels. And their higher endurance is an important safety factor.

The properties of moly steels are discussed in a new booklet "Moly Steels for Cast Gears". Full technical assistance is also yours for the asking. Write Climax Molybdenum Co., Dept. 12, New York 36, N. Y.

**CLIMAX MOLYBDENUM**



TAILORING OVERCOATS for steam piping with DoALL band machines

# NR + HE x T = MMW

**Natural Resources + Human Energy × Tools = Man's Material Welfare**

The formula above sums up how we live: Natural Resources plus Human Energy multiplied by Tools equals Man's Material Welfare (all of his goods, services and material possessions).

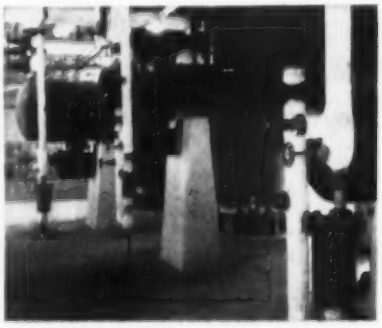
Only with efficient tools can we produce more goods at lower cost. Tools are the only variable in the formula.

The story of the asbestos pipe insulation pictured here dramatizes the formula. Insulation is an overcoat for steam piping. It keeps the heat in. This saves time and money in cooking canned goods, making electricity or refining oil. So the pipe insulation is actually a "tool" of production. It is made with other tools. The big DoALL machines pictured trim the ends and then split the insulation lengthwise so it can be applied to piping.

The endless flexible saw bands in the DoALL machines travel just a fraction under 80 miles per hour. The teeth on the saw take 252,000 bites per minute. Picture the army it would take to do the job by hand.

The future rests upon the ability of industry to acquire a tremendous quantity of highly efficient tools. The multiplying demands of a growing population will one day outstrip our present productive capacity. To meet future demand, industry must be given every inducement to invest in more and better tools. The floodgates of this investment can be opened only through lower taxes, faster write-offs on capital equipment and more efficient use of tools by labor.

Motor oil costs less because efficient tools produce insulation for refinery piping.



BAND TOOL MANUAL — 160 pages of data on DoALL's 18 types of band tools for sawing, slicing, grinding and polishing of any material. Learn how to apply this new concept of machining to increase productivity in your plant. Price . . . 50¢. Call your local DoALL Store or write . . .

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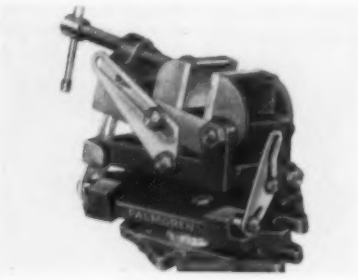
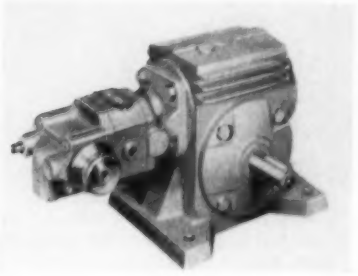


ALL-ANGLE VISE, Palmgren No. 55, is provided with swivel base for 360° horizontal positions. Vise may also be set at an angle from 0 to 90° on its side and locked in position. Vertical angles from 0 to 90° may be obtained by setting the top hinged base in position and locking the support-arm screws. Jaw width is 2½ in., jaw opening 2½ in., and jaw depth 1½ in.—*Chicago Tool & Engineering Co, 8383 S Chicago Ave, Chicago 17, Ill*



FLUID MOTOR–SPEED REDUCER COMBINATION features slow output rpm with torque multiplication. Motor is equipped with built-in relief valve that allows max torque input to speed reducer and prevents overloading. Typical use is in conveyor drives where variable speed is required. Speed reducers are available in a range of ratios, with speed-control valves to handle 0 - 2, 0 - 4, and 0 - 6 gpm. Fluid motors have gear widths of ½, ¾, or 1 in.—*John S Barnes Corp, Rockford, Ill*

**Cloth-and-sisal buffs** called Sisal-Flex, together with cloth buffs termed Tufta-Flex, will cut and color metal in a single operation. Both types utilize double-folded tufts to provide maximum cutting surfaces and retain compound at leading edges. Tufts are staggered in a double row around buff to prevent streaking. Steel center provides support. Buffs are available in diameters ranging from 12 to 18 in.

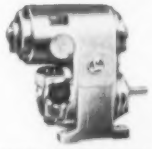
*Hanson-Van Winkle-Munning Co, Church St, Matawan, NJ*

MULTI-PURPOSE PRESS called Little Blacksmith 55 can be furnished with attachments for notching, punching, bending, and straight and angle shearing. Depth of throat is 6½ in. Weight with stand is 330 lb. Floor space occupied is 14 x 24 in.—*J F Kidder Mfg Co, Dept PR-3, 426 Colchester Ave, Burlington, Vt*

FOOT-LIFT HYDRAULIC HAND PALLET TRUCK, Model HX, has capacity of 2000 lb, yet weight of truck is less than 200 lb. Forks have 4½-in. lift. Load is raised to travel position by treadle attached to pull handle—*Barrett-Cravens Co, 628 Dundee Rd, Northbrook, Ill*

**Dial bore gages** in 1000 series provide one basic gage covering a range of ¼ to over 5 in. Interchangeable tips are used for checking bores, grooves, threads, reliefs, splines, and gears. Of pistol-grip design, gages provide 0.0001-in. readings with instantaneous centralization and little or no rocking. Retractable tips have

## Can your machinery meet the challenge of change?



STERLING SPEED-TROL VARIABLE SPEED MOTORS

STERLING SLO-SPEED GEAR MOTORS

STERLING CONSTANT NORMAL SPEED MOTORS

STERLING MULTI-MOUNT SPEED REDUCERS

**Sterling Speed-Trol Variable Speed Motors** provide you with one of industry's greatest production advantages—versatility of machinery and equipment. Only by adapting speed of machinery to changes in product, material, volume or to any other factor influencing productivity and product quality can you have this important competitive advantage—operating machinery at optimum efficiency under changing production conditions. Investigate the benefits Speed-Trol Variable Speed Motors can bring to your plant. They have your production future built into them.

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Sterling offers you a wide range of Electric Power Drives of advanced design—variable speed or constant speed—with manual or automatic controls.

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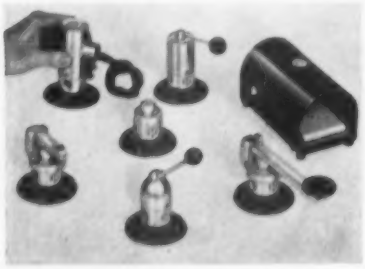
STERLING ELECTRIC MOTORS

Los Angeles 22 • Chicago 36 • Cincinnati 37 • New York 51

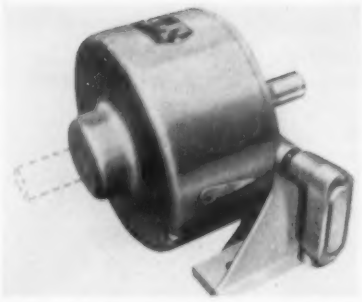
straight-line expansion of 0.260 or 0.400 in. at any of the infinite number of settings.

*Rimat Gage Co, 21 W Dayton St, Pasadena, Calif*

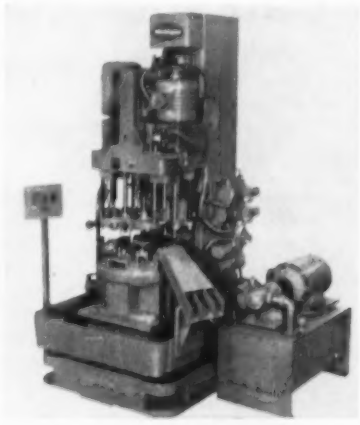


FLOW-CONTROL VALVES called Quick-Dump utilize a single basic valve body which may be used either normally open or normally closed, depending on port connections. Variety of triggering devices can be added to this basic body. Seven models are available: solenoid, cam-operated, palm button, fingertip, foot-operated, and two types with hand lever. Unit is adapted for applications up to 125 psi and under temperature variations from −40 to 225 F.—*Humphrey Products, General Gas Light Co, Kalamazoo, Mich*

SMALL PRECISION BORING MACHINE, developed by Mecanair of Sudbury, Mass, is intended for boring small holes in instrument parts and housings. Worktable is operated by air cylinder and hydraulic check unit, which can be adjusted for varying amounts of feed. Cross-slide can be attached to table for facing in the same cycle as boring operation. Additional head may be added to perform dual boring. Company plans to sell machine for less than $5000—*Jones & Lamson Machine Co, 502 Clinton St, Springfield, Vt*



FOOT-MOUNTED MAGNETIC BRAKE of disk type can be mounted separately from motor, provides braking advantages of disk brake where a direct, end-bell-mounted unit cannot be used. Units are available with bearings and shaft where a coupling is used between machine and brake, or without shaft to permit extension of machine's drive directly into the brake. Several ratings for continuous and intermittent duty between 3 and 35 ft-lb are offered—*Reuland Electric Co, Alhambra, Calif*



FLANGE NUTS are machined on special automatic unit which drills, chamfers, and taps a ⅝-18 hole. Rate of production is 750 per hr. Standard components are used in the machine, a five-station unit featuring two-place fixture with power clamping and automatic eject—*Michigan Drill Head Co, P O Box 4643, Detroit 34, Mich.*

**Saw-table extensions** facilitate setups for straight or angle cuts in metal plate or flat stock. Accessories consist of T-shaped bars designed to fit the T-slots in standard sawmachine tables. Bars can be slid in or out of table slots independently, providing outboard support for stock longer than table capacity. Studs on ends of bars serve as stops.

*DoAll Co, Des Plaines, Ill*

(Continued on page 218)

***MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES***

The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington and Dover, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
DeLaval Steam Turbine Co., Trenton, N. J.
Empire Pattern & Foundry Co., Tulsa, Okla.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machine Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
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Hardinge Company, Inc., New York, N. Y.
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The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Shenango-Penn Mold Co., Dover, Ohio
Sonith Industries, Inc., Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
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Otis Elevator Co., Ltd., Hamilton, Ontario

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• **PRINCIPLES OF HEAT TREATMENT**

***Write today to Meehanite Metal Corporation, Dept. 4D, 714 North Avenue, New Rochelle, N. Y.***

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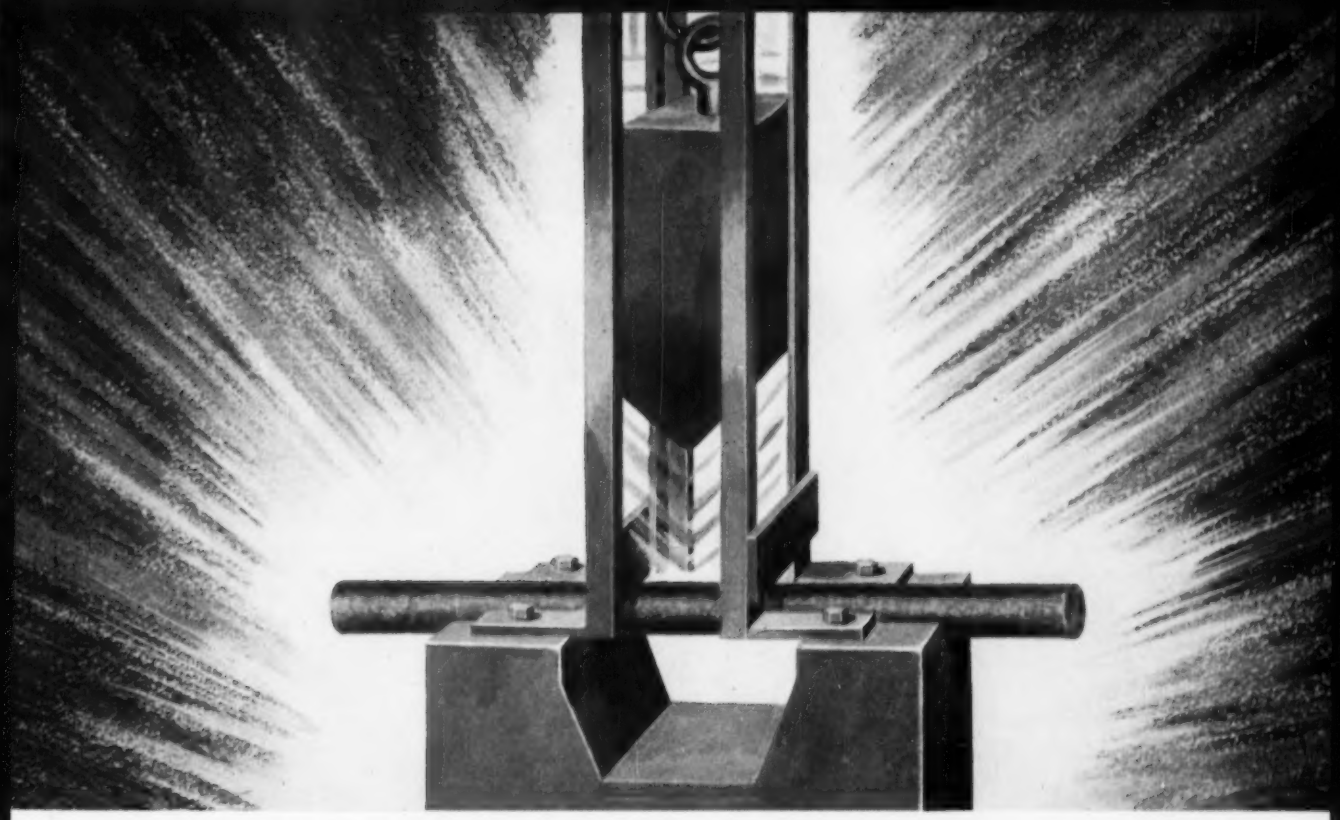
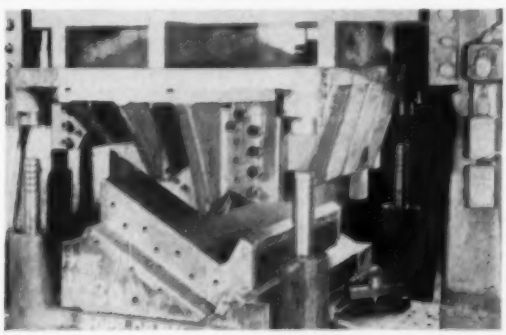


# EXCELLENT SHOCK-RESISTING PROPERTIES OF MEEHANITE CASTINGS OFFER PROOF OF HIGH STRENGTH AND TOUGHNESS

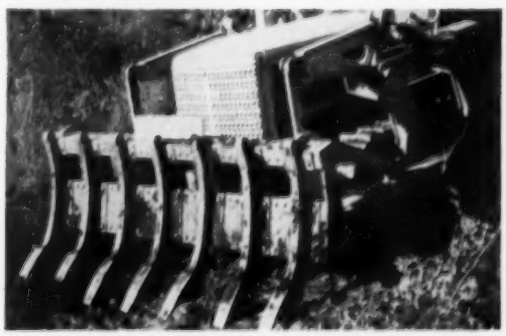
| PERMANENT DISTORTION | | | | |
|---|---|---|---|---|
| Impact Foot Pounds | Mild Steel: Deflection | Cast Steel: Deflection | Type GA Meehanite, As Cast: Deflection | Type GAH Meehanite, Heat-Treated: Deflection |
| 10 | 0 | 0 | .001 | 0 |
| 12½ | .005 | .005 | .004 | 0 |
| 15 | .007 | .007 | .008 | 0 |
| 17½ | .024 | .027 | .013 | 0 |
| 20 | .037 | .047 | .019 | .002 |
| 22½ | .048 | .064 | .027 | .005 |
| 25 | .071 | .089 | .033 | .006 |
| 27½ | .098 | .110 | .042 | .007 |

*These drop test results provide a measure of the impact strength of Meehanite. Test bars (1" dia. x 8" long) were subjected to a series of blows from different heights.*

Structurally controlled Meehanite Metal Castings are available in 26 different property combinations to meet exacting engineering requirements. When superior shock-resistant qualities combined with strength and wear resistance are demanded, Meehanite Metal control provides designers and engineers with assurance of casting uniformity and dependable job performance. *For more information, send for your copy of the "Principles of Heat Treatment."*



Meehanite Forming Dies give longer service life and freedom from scuffing and galling.



Meehanite Metal Tooth Caps for heavy-duty land clearing rakes provide long wear life without failure under severe impact conditions.

# MEEHANITE METAL®

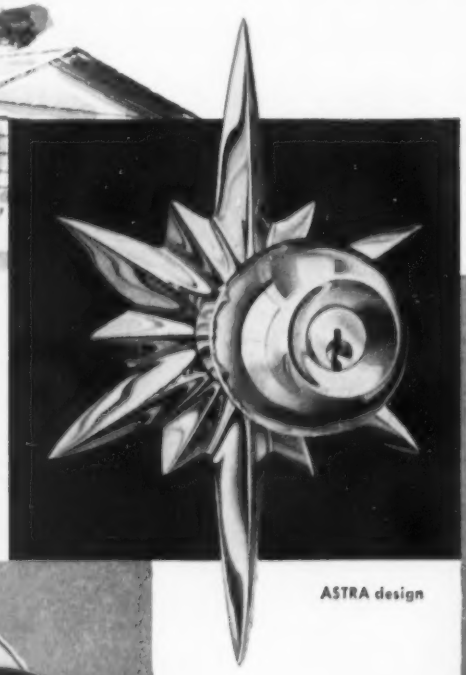
**MEEHANITE METAL CORPORATION • NEW ROCHELLE • NEW YORK**

# MUELLER BRASS CO.

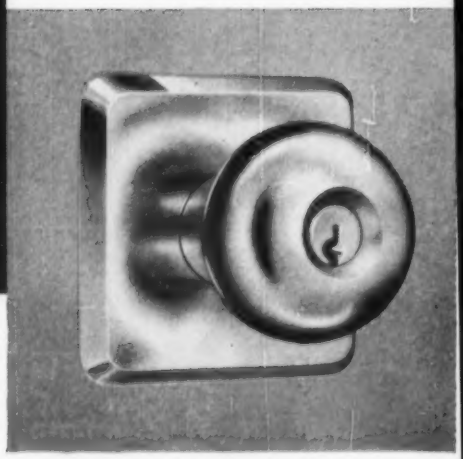
## brass and bronze forgings help insure dependability and lasting jewel-like finish of distinctive SCHLAGE locks

Smart styling, handsome appearance and durability have been neatly combined by the Schlage Lock Company of San Francisco in their line of lock designs for residential and commercial use. Many important parts of these lock sets are brass und bronze forgings made by the Mueller Brass Co. The beautiful natural color, corrosion resistance, and inherent dependability of these forgings make them ideal for this purpose. In addition, the high degree of surface smoothness makes possible an exceptionally lustrous finish as well as a perfect plating surface when required. Then, too, the use of forgings has reduced costs, cut finishing time and greatly reduced the number of rejects when compared to the sand castings that were formerly used.

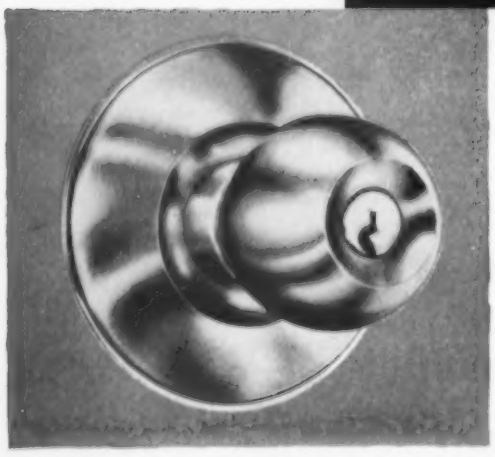
Whether you manufacture decorative hardware where finish is of prime importance or rugged assemblies that must stand up to bruising everyday punishment, it will pay you to investigate Mueller Brass Co. forgings. Strong, long wearing brass, bronze or aluminum parts, forged to your exact specifications under exacting statistical quality control standards can help you reduce costs, improve performance, and give you a better looking product. Write for our engineering manual (No. H-58565) . . . or call in one of our engineers to investigate possible forging applications in your products.



ASTRA design

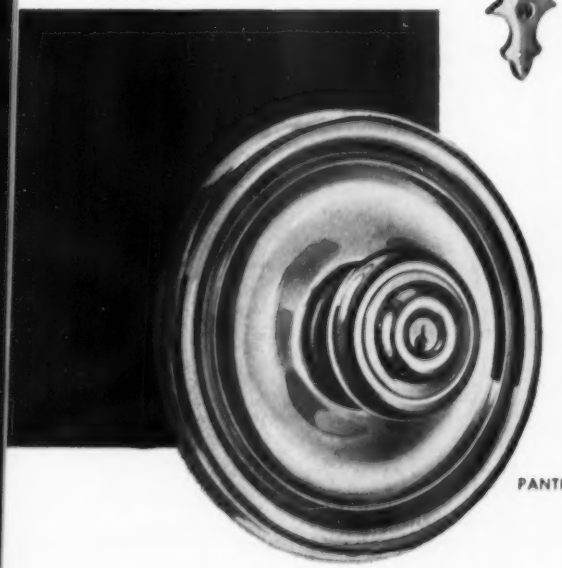


MONARCH design



MERCURY design

WAVERLY design



PANTHEON design

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Engineering Manual H-58565 ☐

Tuf Stuf Aluminum Bronze Alloys
Engineering Manual H-58563 ☐

600 Series Bearing Alloys
Engineering Manual FM-3000 ☐

Copper Base Alloys in Rod Form
Engineering Manual FM-3010 ☐

## METALS AND ALLOYS REVIEW

**by FRANK M. LEVY**
**Vice-President and Director of Research**

Last week one of our sales engineers was at the home office and we were talking about one of his customers in the East who manufactures milling machines which are being used for milling aircraft spars. We are supplying gibs, slide bars and wear strips to this company made of our "600" series bearing metal in rectangular rod form. The material formerly used was aluminum bronze* cast bars which they could only obtain in 36" lengths. Their engineering department estimates that costs have been reduced 50% on this component. Machining time has been reduced and impregnation of porous castings has been eliminated.

Our sales representative was curious about my experience with "600" in other applications such as this. Oddly enough, our own plant has been a pretty good proving ground. In our extrusion department, for example, we have gotten exceptionally good service from slides made of "600" and used on the die heads which are subject to pressure and extremely rough usage.

Bob Irwin of our forging department reports that the "600" strips he has used for lining the ways of our big forging presses have proved far superior to the bronzes which were original equipment. The bronze strips squashed out after protracted running. More important, the "600" strips last 10 times longer before replacement is necessary.

In our copper tube fabricating department we have a lot of automatic equipment for the production of formed tube shapes like tees and ells used in the plumbing industry. On one of the tube benders, there was no provision made for replacing worn forming slides. Our Maintenance Department reworked the machine using "600" strips as replaceable forming slide inserts. The bender is now a far more efficient machine. Because of the long life of "600", downtime on this machine has been practically eliminated.

While we were talking about these uses in our own plant, it brought to mind some other instances where the exceptionally good wearing properties of "600" have been established. A Cincinnati lathe manufacturer uses "600" in the form of counter sunk hexheaded screws on wearing strips used on lathe carriages. When the strip wears to the retaining screw the ways will not be scratched.

According to their own records, all other materials which they had tested proved unsatisfactory for the job. Another maker of precision lathes and milling machines found that after a year of exhaustive tests, the "600" metal that was used as nuts on compound slide screws outlasted competitive metals at an approximate ratio of 3 to 1 at an estimated saving of 30%.

Sliding surfaces on all kinds of machinery have different wear characteristics, as you have undoubtedly found. If you have any problems involving gibs, slide bars or wear strips that are proving troublesome, why not drop me a line or send a part print and we'll be glad to study it and make the proper recommendations.

**We manufacture 4 grades of wrought aluminum bronze.*

# MUELLER BRASS CO.

PORT HURON 23 MICHIGAN

185

# How MICROHONING Makes a Gas-Tight Running Seal Without Piston Rings

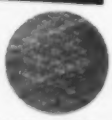
A leak-free, running seal between bores and pistons—without the use of rings—is possible only when the processing method generates diametric and geometric accuracy and the required functional surface finish. These characteristics are simultaneously obtained by the Microhoning process. Here's how:

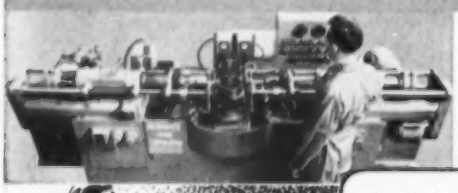
**1** The sticks of abrasives in the tool form an abrasive "cylinder" and are fed out radially with equal pressure in all directions. High spots and tight areas in the bore are abraded first.

**2** The long abrasive sticks cut only on the crests of wavy or snaky surfaces until the bore has the same diameter throughout its full length.

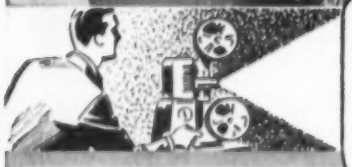
**3** The combination of tool motion (rotation and reciprocation) and feed pressure fractures the abrasive grits that have become dull, and new sharp edges are formed; the clean constant cutting action of every stroke on the full bore length consistently generates the desired surface finish.

One of the exclusive advantages of Microhoning is its ability to produce whatever functional surface characteristics are required for maximum product performance. Microhoning's cross-hatch pattern, with its myriad of minute intersecting "valleys," furnishes an excellent surface for retention of lubrication.





"Here's one of two Micromatic Model 523-2 machines used on the compressor crankcase job. Tecumseh uses a total of 18 Microhoning machines on other vital processing operations."



The principles and applications of Microhoning are thoroughly explained in an informative 16mm., 30-minute sound movie, "Progress in Precision." We'll be glad to reserve a print for your use. Just tell us on the coupon the date you'd like to see it.

☐ Please send me "Progress in Precision" in time for showing on _____ (date)

☐ Please send literature on Microhoning. I am interested in the following application: _____

NAME _____

TITLE _____

COMPANY _____

CITY _____ ZONE _____ STATE _____

**MICROMATIC HONE CORP.**

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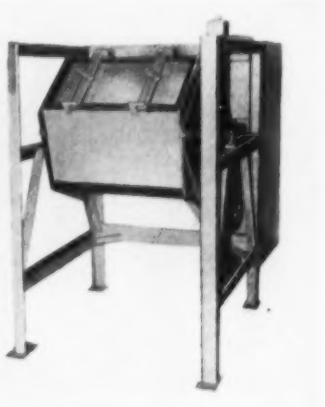
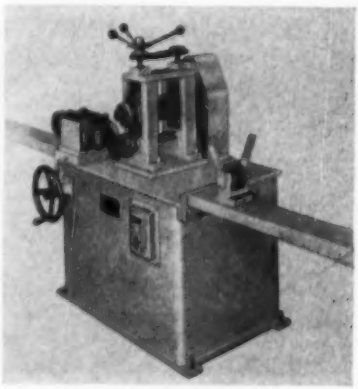


**BARREL FINISHER** Model V-4 has a hexagonal 4-cu-ft tumbling barrel supported at each end and adequately powered for steel-ball burnishing. Power is furnished by ¾-hp, 220/440v, 3-phase motor with either variable or fixed-speed drive. Barrels are available unlined or lined with vinyl plastic—*Rampe Mfg Co, 14915 Woodworth Ave, Cleveland, Ohio*

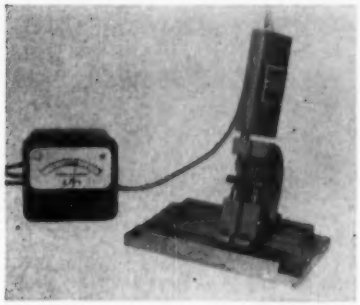


**BAR-STOCK MARKER** permanently marks one side or opposite sides of stock simultaneously. Only adjustment required is made by turning handle to raise or lower rolls for various bar sizes. Unit will handle work from ⅜- to 3-in. dia, round or hexagonal. Both spindles are driven. Unit requires 2 x 16-ft floor space—*Marking Machine Co, 14 Elizabeth St, Battle Creek, Mich*

**Precision-rolled metal strip** is available for metals supplied by company or on a toll arrangement. Thickness tolerances can be held as close as ±0.0001 in. on strips of 0.001-in. thickness and up. Maximum widths of 4 in. can be accommodated, and after rolling can be slit to any de-

sired width. Silver, silver alloys, brass, copper, and other alloys can be handled.

*Handy & Harman, 82 Fulton St, New York, NY*



**ELECTRONIC MICROMETER** called the Minitron features two sets of adjustable anvils for accepting a production run for quick checking without "feel." Gage stand can be quickly preset and locked to conform to a master; pieces are then inserted and indicator position noted. Device has electronic adjustment which permits any magnification from 10,000:1 to 1000:1. When adjusted for largest magnification, 0.0001 in. appears over one full inch—*Industrial Gauges Corp, EAM Div, Englewood, NJ*

**AIR - OPERATED TOGGLE CLAMP,** Clamp-omatic Model 810, is available with U-bar for vertical and lateral adjustment of pressure spindle, or with solid bar and bolt retainer. Several types of adjustment are available. Air-cylinder bore is 1½ in., with stroke of 2¼ in.—*Detroit Stamping Co, Detroit, Mich*

**Measuring and calculating instrument** called Caliputer combines the functions of a slide-rule vernier caliper and vernier depth gage and computer. Stainless-steel device is only 4¾ in. long. Readings are accurate to 0.001 in.; a second linear scale is graduated to thirty-seconds of an inch. Instrument retails at $8.95.

*Caliputer, PO Box 586, Rancho Santa Fe, Calif*


# Why TECUMSEH Compressor Crankcases Are MICROHONED

"On Tecumseh compressors, we Microhone the piston bores. ***This gives us a running seal between pistons and bores which prevents gas leakage and eliminates the need for piston rings!*** Believe me, it takes a real combination of accuracy and functional surface finish to get results like that . . . and only Microhoning has given us that combination!"

(Tecumseh Products Company, Tecumseh, Michigan, is the world's largest producer of refrigeration compressors. Precision engineered and processed these units are hermetically sealed before leaving the factory.)

**OTHER JOB DATA:**

| | |
|---|---|
| MATERIAL | Cast iron |
| PRECEDING OPERATION | Diamond finish-bore |
| MICROHONING OPERATIONS | One |
| STOCK REMOVAL | .0007" to .001" |
| FINISH | 10 Microinches |
| TOLERANCES | |
| Diametric | .0003" |
| Roundness | .00015" |
| Straightness (Taper) | .00015" |
| HONING CYCLE | 18 seconds, including fixture indexing time |

"Here's our twin cylinder crankcase. The two piston bores in each case are opposite one another in the vertical plane, but they lie in two different horizontal planes. We simultaneously Microhone both bores in each crankcase, using a horizontal type machine with two opposing spindles."

"Although all of our crankcases are similar in design, the bores vary in diameter — 1.312", 1.375", 1.500" and 1.625". Two fixtures on a two-position rotary indexing table let us Microhone one crankcase while another is being loaded. To run different bore diameters we just change the tools and gage rings. Switchover time is about five minutes."

Let a Micromatic Field Engineer show you how Microhoning will give you better functional finishes, closer tolerances and higher production.

☐ *Please have a Micromatic Field Engineer contact us.*

☐ *Please send literature and case histories on Microhoning.*

NAME _____

TITLE _____

COMPANY _____

CITY _____ ZONE _____ STATE _____

**MICROMATIC HONE CORP.**

8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

# Why you get more service from V-Belts with CONCAVE SIDES

Fig. 1

Fig. 1-A

*Each sidewall of a Gates V-belt is concave (Fig. 1)—a precisely engineered curve that makes V-belts last far longer.*

**HERE'S WHY:** on the bend around the sheave, the concave sides of a Gates V-belt fill out and become straight (Fig. 1-A). Thus the belt makes full contact with the sides of the sheave, grips the sheave *evenly*. This even contact distributes wear uniformly across the sides of the belt.

Uniform wear lengthens belt life; keeps costs down.

MAKE THIS SIMPLE TEST

Fig. 2

Fig. 2-A

Bend a straight-sided belt (Fig. 2). The sides bulge at the bend causing uneven contact in the pulley groove (Fig. 2-A). Naturally, wear is greater at points indicated by arrows. Result: shorter belt life, increased belt costs.

To cut down-time and V-belt replacement costs, specify belts that grip evenly and wear longer. Specify Gates Vulco Rope—the V-belt with concave sides. There is a Gates distributor nearby who will quickly supply the belts you need. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

*There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.*

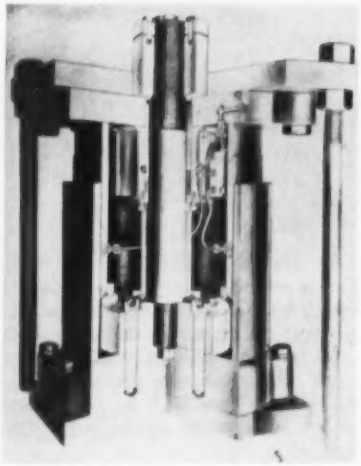
Gates

TPA 109

# Gates VULCO ROPE Drives


## NEW SHOP EQUIPMENT

**METAL-PARTS DEGREASER,** Series OP3, is specially designed for cleaning parts that have a tendency to nest or pack, or parts that have recesses difficult to penetrate with a hand spray. Cleaning cycle consists of passing work through consecutive stages of boiling solvent, warm liquid, and vapor dip. Eight models are available in series, with work loads ranging from 75 to 1200 lb of steel per hr—*Circo Equipment Co, 51 Terminal Ave, Clark (Rahway), NJ*



**PNEUMATIC DIE CUSHION,** all-steel Model DR, is available in stock in five sizes from 8 to 16 in., with ring-holding pressure of from 5 to 20 tons. Unit is provided with high-pressure lubricating system and internal guiding means to compensate for off-center loading of the hardened-and-ground pin pressure pad. Of universal application, cushion can be used on practically any power press—*Dayton Rogers Mfg Co, 2824 13th Ave S, Minneapolis 7, Minn*

*from Johnson's Wax*

# The only major improvement in coolants in 50 years

Johnson's metalworking fluids came in with automation. They are as efficient and advanced as 1956 high-speed machine tools. They bring you the first major improvement in coolants since 1900—*the use of wax and wax-type synthetics.*

Johnson's discovery has uncovered tremendous new profit possibilities for hundreds of progressive shops. To get increased production from men and machines, use Johnson's complete line of metalworking fluids for machining, grinding, forming.

Contact your local Johnson's industrial distributor. He will gladly set up an in-your-shop test. Be sure to ask about Johnson's money-back *Guarantee of Superior Performance* over ordinary coolants.

*S. C. Johnson & Son, Inc.*
Industrial Products Dept., Racine, Wisconsin

*Pictured below is Johnson's J-Cool, one of a complete line of modern coolants for today's high-speed production.*

# New CENTERLESS LAPPER

## by SIZE CONTROL

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**THE NAMES SPOTLIGHTING THIS MACHINE DEMAND THE ULTIMATE IN PRECISION AND QUALITY IN THEIR OWN PRODUCTS.**

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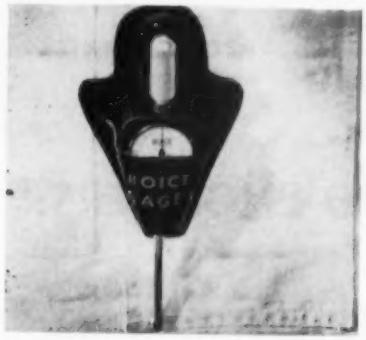
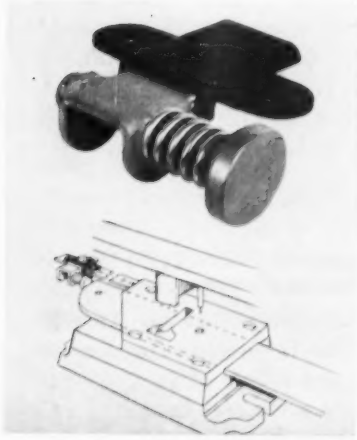


SMALL-DIAMETER BORE GAGE, Model No. 1, has ¼-in. adjustment for any size hole from ¼ to ½-in. diameter. Fixed pin equalizers insure positive centralization in hole. Only three range extensions are required for adjustment range; no adaptors are needed. Included with gage is leather pouch which attaches to operator's apron—*Boice Gages, Inc, Staatsburg NY*



DIE STOP can be installed in minutes on any die and is adjustable two ways for any parting-die operation. Device is installed by drilling one screw hole plus two dowel holes on back rail of die, screwing die stop into position, and anchoring it with dowel pins. Stop is made of rustproof-plated steel—*Keystone Engineering & Mfg Co, 122 SW 16th St, Des Moines, Iowa*

**Live bushing sizes** for horizontal milling machine outer-support applications are available in taper sizes, lengths, arbor and body diameters to fit both extended and built-in applications of several makes of millers. Sealed bushing replaces the bronze bushing in the

(Continued on page 224)


**Only Cutter Grinder in the WORLD with all these features**

END MILL CENTRA·POINT GRINDER

*Specifically designed for sharpening the small cutters that are so difficult to grind on large machines, CENTRA-POINT is fully described in Bulletin M-55.*

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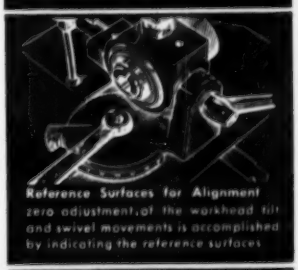
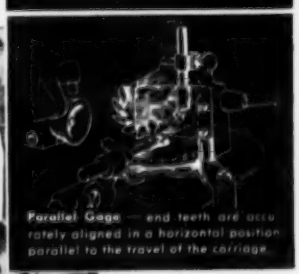
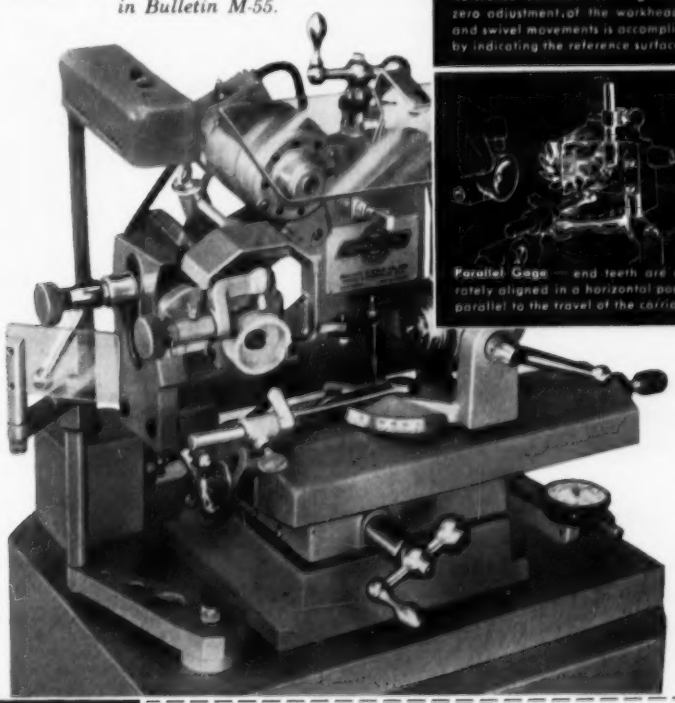
**Mechanical Wheel Dressing** — an accurate radius is mechanically dressed on the grinding wheel, in correct relationship to self-registering tooth rests



**Reference Surfaces for Alignment** — zero adjustment of the workhead tilt and swivel movements is accomplished by indicating the reference surfaces



**Parallel Gage** — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage



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**CENTRA-POINT DIVISION**

William H. Field Co., Inc., 326 Dorchester Ave., Boston 27, Mass.

Please send a copy of the new CENTRA-POINT Data Sheet.

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# THE SHORTAGE OF SCIENTISTS AND ENGINEERS:

# What Caused It?

WHY is the United States confronted with a serious shortage of scientists and engineers?

One reason, discussed in earlier editorials in this series, is that the increasingly complex technology needed for national security and for an expanding economy has raised enormously the demand for technically trained people.

**But it is clear also that too little has been done to increase the supply of scientists and engineers and to make most effective use of the limited number now available.** It is with this second reason for the shortage that this editorial deals.

Too few bright young people have been attracted to careers in the sciences and engineering. Many with technical training have been leaving these professions, with the exodus from teaching being especially alarming. And the technical talent now employed in industry, government and education is, in too many instances, being utilized less effectively than it might be.

## Paying for a Miscalculation

A legacy of the depression provides part of the explanation for the current shortage of young people entering scientific and engineering careers. Because of low birthrates in the 1930s, there are now about one million fewer boys and girls of college age than there were in the early 1940s. Not until 1960 will there be as many in the 18-21 age group as in 1945. And from the brightest young people of these ages must come, not only scientists and engineers, but the new members of all the professions needed by our growing economy.

A miscalculation in the late 1940s, when our future needs in various occupations were being gauged, provides another part of the explanation. Occupational counselors and high school students were advised that, because of heavy postwar enrollments in engineering and other technical fields, "it is likely that the shortages of trained men will be alleviated in a few years."*

Instead of being alleviated, however, the shortages became more acute. Job opportunities grew rapidly, while graduating classes dwindled. Fewer than half as many students received degrees in engineering in 1955 as in 1950, the peak postwar year. The trend has been reversed, but graduating classes will not be large enough to narrow the gap for several years.

## Lost Talent

Beyond these temporary conditions, there is another explanation for the failure of the number of scientists and engineers to keep pace with our rising needs. This is the staggering loss between high school and college of young people with the talent to be successful in science and engineering. **Last year between 60,000 and 100,000 high school graduates of college ability failed to enroll in college for financial reasons and perhaps an additional 100,000 did not enter college because of lack of interest.†**

Of the most intelligent 20 percent in the group of college age, fewer than half enter college and only about a third graduate from college. Educational authorities estimate that fewer than 2 percent of those in the college age group who are mentally equipped to obtain Ph. D. degrees will actually obtain such degrees.

**Another crucial stage is in the high**

*U. S. Bureau of Labor Statistics, *Occupational Outlook Handbook* (Bulletin 940), p. 63.

†Charles C. Cole, Jr. (assistant dean, Columbia College, Columbia University), *Higher Education*, November 1955.

**schools, where future scientists and engineers receive their first training in science and mathematics. There are serious weaknesses and signs of deterioration in this vital part of our educational system.**

One-quarter of all American high schools offer no chemistry or physics. One-quarter offer no geometry. In many of the schools offering science and mathematics courses, the quality of instruction is low. Last year in the New York City school system alone more than 10,000 students were in science classes taught by teachers who were not trained in science.

**This is a situation that threatens to become much worse.** Between 1950 and 1955 the number of graduating teachers qualified to teach high school mathematics dropped 53 percent and those qualified to teach science dropped 59 percent. Furthermore, only about 60 percent of the graduates certified to teach mathematics or science in 1955 entered teaching as a career.

On the students' side — partly because of inadequate guidance programs — there has been a drift away from science and mathematics courses. The result of low student interest, and poor high school programs, in science and mathematics is virtually to foreclose careers in science and engineering to many bright young people. They miss the necessary basic training. Many who do attempt to obtain college training in these fields are ill-equipped. Engineering school deans report that fully half of their students enter with deficiencies in mathematics.

## Misuse of Trained People

**Scientific and engineering careers have long had a reputation for low salaries and limited opportunities for advancement.** In recent years starting salaries have sky-rocketed and have been accorded wide publicity. But unfortunately there has been much less improvement in the salaries paid experienced engineers and scientists, especially in government and education. This has lowered the morale of experienced men and provided an incentive to desert engineering and research positions for higher paying jobs in sales or management.

Engineers and research scientists complain also that too much of their time now is spent on tasks that draftsmen and technicians could perform. Unfortunately for easy solution of this problem, however, there is an acute shortage of technicians as well. Worse still, there are indications that some companies in industries using large numbers of engineers have gobbled up technical manpower at a faster rate than they can effectively employ these scarce people.

Another drain on the supply of newly-trained scientists and engineers is military service. About 8,000 of this year's 27,000 engineering graduates were in ROTC programs and committed to active duty after graduation. Dr. A. W. Davison, chairman of the Engineering Manpower Commission of the Engineers Joint Council, says that in most cases no attempt is made by the Armed Services to assign these young officers to duties for which their engineering education specifically prepared them. They are not only withheld from industry and education for two years but also are not utilized in defense programs requiring more engineers and research scientists.

**Some of the causes for the present shortage of scientists and engineers — bad advice a few years ago and a college age group held down by depression birthrates in the 1930s — are gradually being overcome. But others, such as the deterioration of science and mathematics training in our public schools and the many instances of ineffective utilization of scarce technical talent, enjoy no such prospect of automatic correction.** The final editorial in this series will deal with some practical suggestions for meeting these problems.

*This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.*

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Donald C. McGraw

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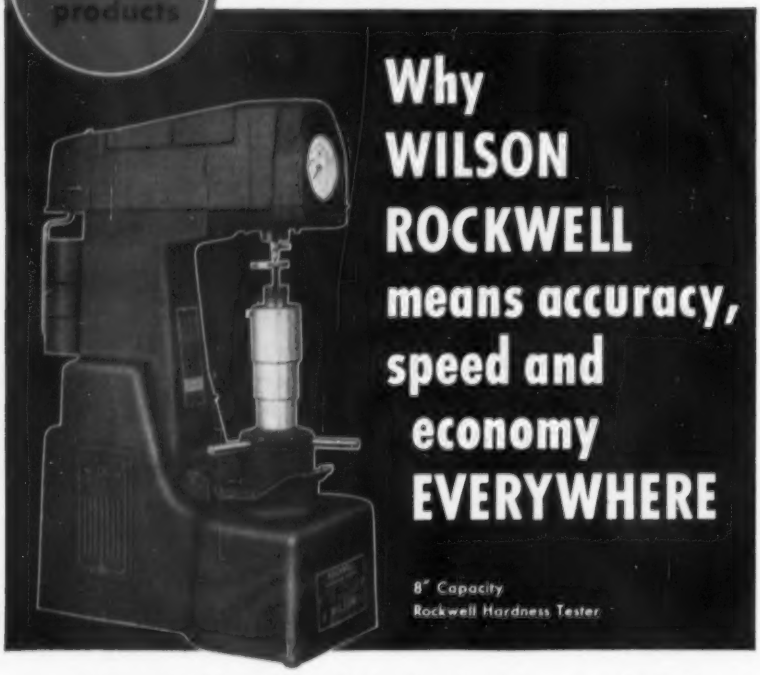
ACCO products

# Wilson "Rockwell"* Hardness Testers

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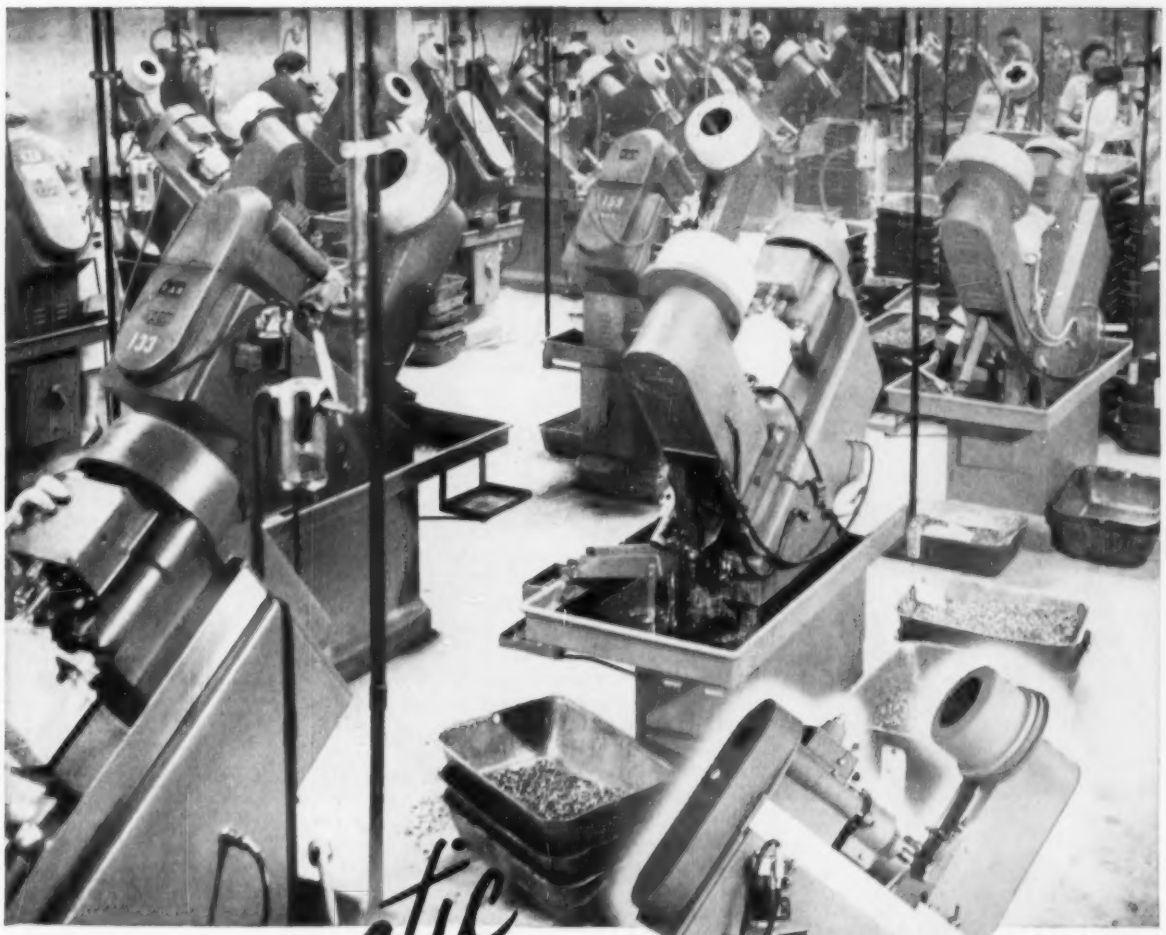
outer support, increasing speeds and feeds, as well as eliminating freezing of the arbor and allowing use of carbide tools to full capacity.
*Jergens Div, Donley Products, Inc, 11106 Avon Ave, Cleveland, Ohio*

**Red plastic hose,** Type H-52, is designed for handling compressed air and oil at working pressures up to 125 psi; actual bursting pressure at 75 F is 600 psi. Hose is reported to be resistant to oil, abrasion, gasoline, and water. Available in sizes of 3/16, 9/32, ⅜, and ½ in. ID, hose is carried in stock in 100-ft coils with or without fittings assembled.
*Hofmann Engineering Co, 5601 S Crawford Ave, Chicago 29, Ill*

**Pickling reagent,** Activol 1357, is an odorless, non-flammable liquid that dissolves in all acids and provides uniform control of bath solutions on metal surfaces in batch, continuous or spray pickling. Its detergent properties insure a clean surface while its inhibiting properties prevent pitting and eliminate hydrogen embrittlement of metal.
*Harry Miller Corp, 4th & Bristol Sts, Philadelphia 40, Penna*

**Flexible gear coupling,** spacer type, consists of flexible hubs on both the driver and driven shafts and a spacer which has teeth that mate with each sleeve in a spline fit. No wrenches or special tools are required and it is possible to remove hubs from either shaft without disturbing mountings of the connected units. Couplings are available in stock sizes ⅞-in. to 3-in. with capacities of 4 to 80 hp/100 rpm. Larger sizes and special types supplied upon application.
*Sier-Bath Gear & Pump Co, Inc, 9238 Hudson Blvd, North Bergen, NJ*

**Semi-automatic wet drill pointer,** Model 510, is now available with two alternative methods of supplying coolant to the tool area being ground. Standard unit is equipped so that coolant is discharged directly on the surface of the drill point and adjacent area of the grinding wheel. In the first alternative method, user purchases a wheel with sealed OD; sealing prevents misdirection of coolant because of centrifugal force. Grinding wheel employed is of cup type with steel backing, so that the only egress for coolant is in the direction of the tool being ground. Second alternative method is a com-



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bination of the above two methods. This set-up permits a flow of coolant both on wheel surface and work as well as "through the wheel." Use of water through the wheel further assures cool grind.

*Oliver Instrument Co, 1414 E Maumee St, Adrian, Mich*

**Spray-lubrication system** for cutting operations can be directed from underside of curled chip or from any other angle. Oil spray is produced within nozzle, by means of a tube within a tube, to produce a uniform spray. Control valves are designed to be closely mounted in manifold for multi-point application, and can be adjusted to regulate flow of both air and liquid. Average unit occupies space of 14 x 20 x 7 in. with a 2-gal reservoir.

*C A Norgren Co, 3299 S Elati St, Englewood, Calif*

**Washer-face hex nut,** Type TEE2032, is designed for minimum wrench-clearance applications. Made of high-strength steel, nut is available in ¼-28 thread size. Red nylon collar provides self-locking feature which holds nut in place. Load-bearing capacity is reportedly 20% greater than standard nuts of equivalent size.

*Elastic Stop Nut Corp of America, Union, NJ*

**Hand hammers** in No-Bounce line feature tubular head loaded with steel grit, a construction which causes hammer to "follow through" the stroke instead of bouncing. Tools are available in several sizes of soft- and metal-faced types. Soft-faced tappers employing same principle are also offered, in lengths of 5 and 8 in.

*Tahlen Hammer Co, 1729 First Ave S, Seattle 4, Wash*

**Aluminum-oxide cement known** as Kellundite No. 8 is designed to provide a heat-resistant, long-lasting lining for indirect arc-type electric furnaces. Linings weigh from 500 to 1000 lb. Material can also be used for patching existing furnace linings.

*Electro Refractories & Abrasives Corp, Buffalo, NY*

**Iron-powder electrode,** Easyarc 14, is designed to meet proposed AWS classification E6014. Electrode reportedly has no tendency to "flat-top" and its smooth beads and easy slag removal make it well-suited for horizontal fillets. It is said to operate well on low, open-circuit voltage, and to be suitable for all types of mild steel fabrication.

*Air Reduction Sales Co, Div of Air Reduction Co, Inc, 60 E 42nd St, New York 17, NY*

**Ultrasonic transducer** of stack-tool type is designed so that tools can be mounted on it for soldering, cutting, or other ultrasonic applications. Water-cooled jackets can be supplied. Unit is available as a separate item for use with already existing generators made for ultrasonic or other uses. Device operates at standard frequency of 19.2, ± 5%. Input power is 250 to 500 w at 75 ohms.

*Alcar Instruments, Inc, 17 Industrial Ave, Little Ferry, NJ*

**Anti-backlash gear assemblies** available as standard stock items range in PD from 1 to 2 in., and are available in 14½ or 20° pressure angles. Hubs are of 303 stainless steel, clamp or solid type. Available bore sizes are 0.125, 0.1875, and 0.250 in. Gear blanks are 24ST aluminum, centerless ground for max parallelism and cut to Class I precision tolerance. Catalog D-64, Supplement C.

*Dynamic Gear Co, Inc, 20 Merrick Rd, Amityville, NY*

**Short servo,** Type 2V-3362, measures only ½ in. long by 1 in. in diameter, but is said to be almost as powerful as a Size 10 servo twice as large. Unit has 1/3 the torque but ½ the rotor inertia of the Size 10. Tiny motor is designed for applications requiring slightly less power but considerably less space than the larger motor.

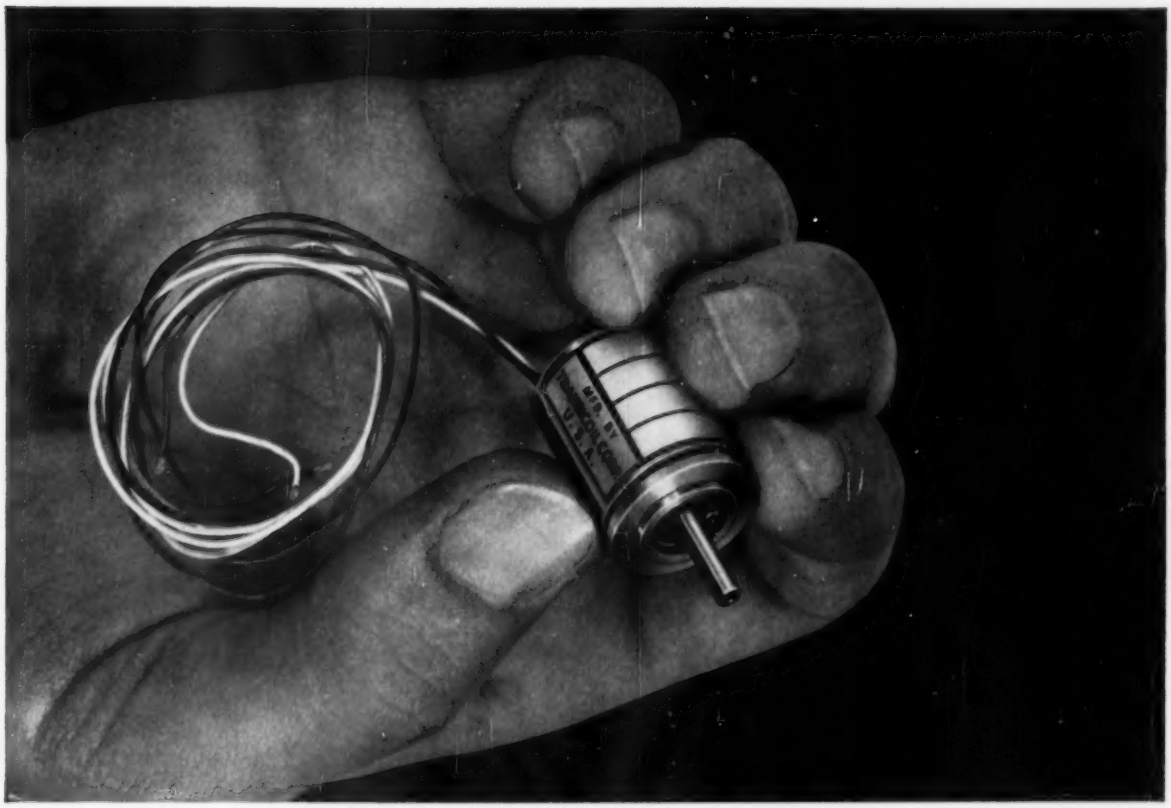
*John Oster Mfg Co, Avionic Div, Racine, Wis*

**Electrical timing meters** for ac operations are available in 10,000-hr models (showing 1/10 hr) and in 100,000-hr models. Small devices are enclosed and sealed, with power provided by synchronous motors. Any equipment powered by alternating current can be equipped with these meters. Catalog AC-587.

*John W Hobbs Corp, Springfield, Ill*

**Magnetic separator and filter** called Delpark, similar to previous model (AM—Feb 13 '56, p192) but with

(Continued on page 230)



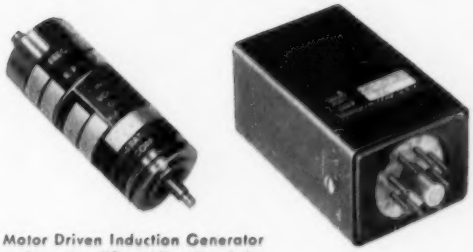
# NEW Size 8 servo combination rivals Size 9 performance

Here, no bigger than your thumb, is the smallest *practical* servo control motor currently produced. Combined with Transicoil's new Size 8 motor driven induction generator, and powered by a new completely-transistorized servo amplifier, this motor offers you the unusually high torque-to-inertia ratio of 28,000 radians/sec$^2$.

Compared with a Size 9 control motor—until now, the smallest practical unit available—Transicoil's new Size 8 measures only 0.75 inches in diameter, 10% smaller, and weighs only 1.4 oz., 40% lighter. Yet it operates on standard voltages from 26 to 52 volts, and 52 volts with center tap, at 400 cps, permitting push-pull transistor application.

Hence, just as Transicoil's introduction of plate to plate wiring eliminated the transformer, once necessary in servo systems, the Size 8 units and transistor amplifiers mark another milestone in miniaturization.

This is just one more example of how Transicoil can solve your control problems whether they involve miniaturization or control complexity, and go on to manufacture systems and components of the utmost precision and accuracy. You pay only for results—on a fixed fee basis for equipment delivered and performing properly.



Size 8 Motor Driven Induction Generator and Transistor Amplifier. All units of the Size 8 system have been designed for maximum performance in minimum space.

Technical data on the new Size 8 combination and the transistorized amplifier is yours for the asking. But you'll end up with a better system if you write outlining your servo control problem.

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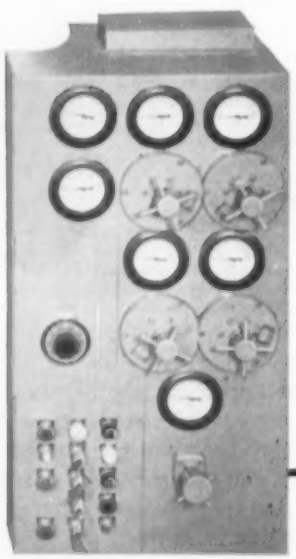
EVERY ADJUSTMENT of speed, timing and pressure is made by the operator on this Control Panel without leaving his operating station. It is no longer necessary for him to climb to the top of the press for this purpose.



## ...the only press that can do so many things so well

THIS hydraulic press revolutionizes the high speed production of draw-formed parts. We believe that it has rendered obsolete every double-acting and triple-acting press now in service. These are challenging statements... *but read the facts.*

**A. B. Farquhar Division, The Oliver Corporation**
**Press Department, York 13, Pennsylvania**

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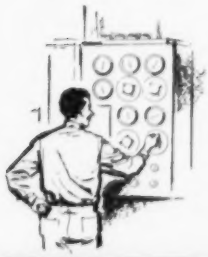
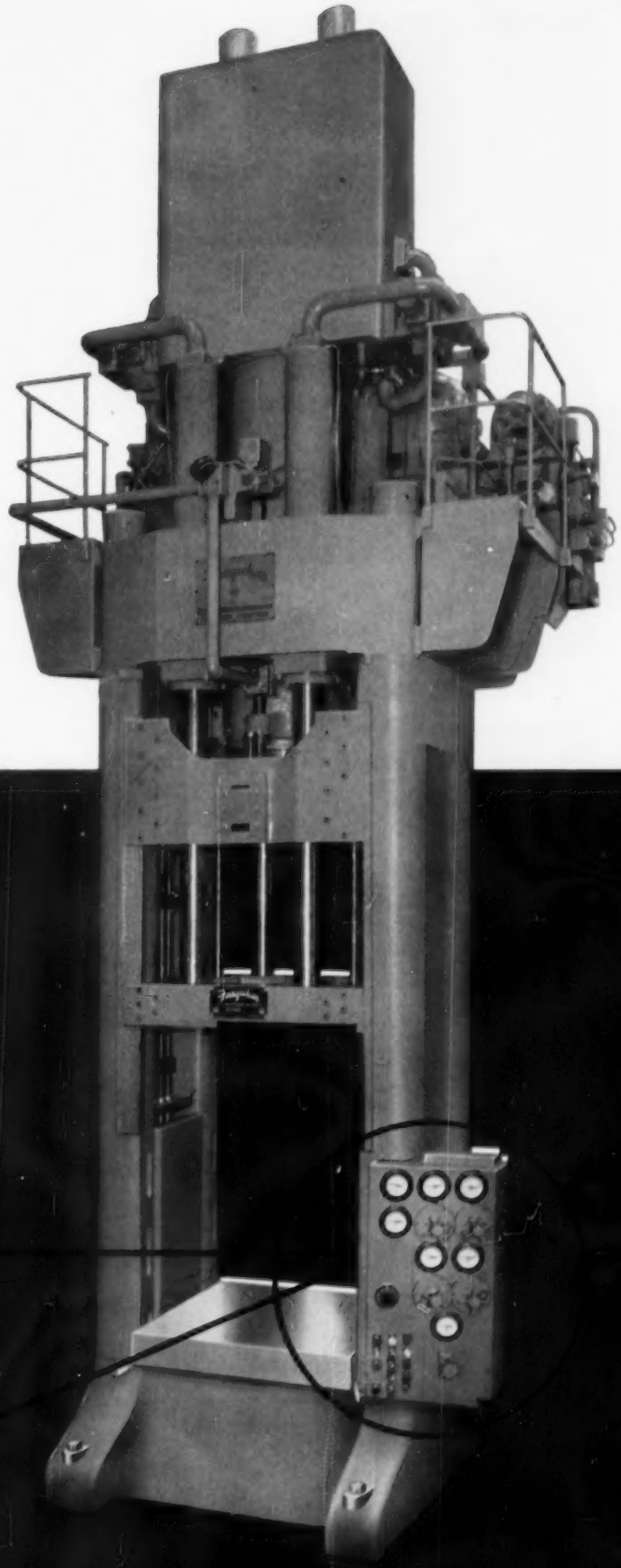
- **Unlimited speed changes** now possible at any point in the cycle. This means, for example, that the ram can approach the draw at maximum speed, slow down as it enters the draw, change speed in the middle of the draw, strip slowly and return to up position at maximum speed.
- **Draw-forming of difficult materials** is thereby greatly simplified and improved. The exact speed can be selected which is best suited to the characteristics of the material at any point in the stroke.
- **Expensive dies** can be given added protection by "gentle" treatment at point of contact and withdrawal.
- **Cycle time is greatly reduced,** because maximum speeds can be attained at every desired point in the cycle.
- **No expensive cams** with time-consuming adjustments are needed to obtain these results. All speed changes are made by dial settings on the control panel.

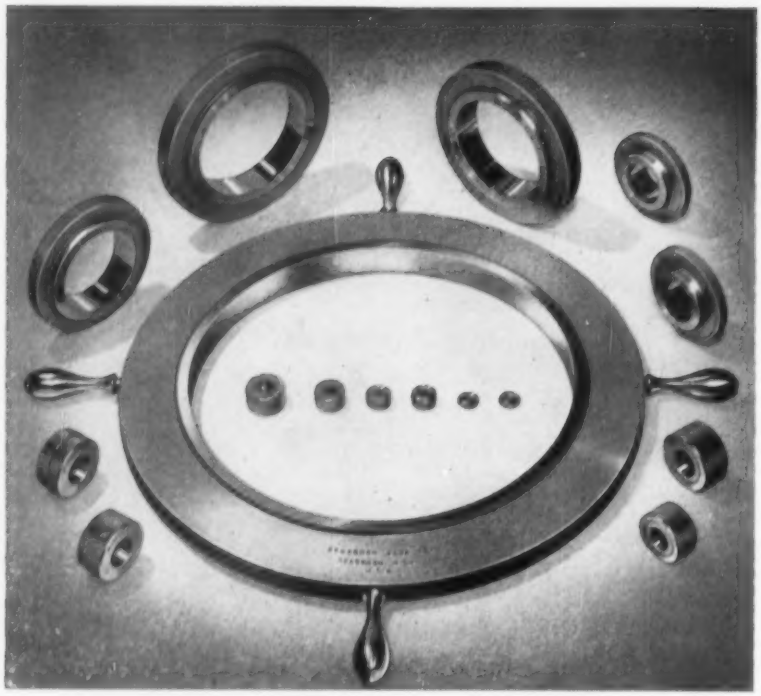




- **4-point adjustment of blank holder pressure** is made by operator without leaving operating station, an important device in the draw-forming of eccentric shapes. This has been a feature of Farquhar Double-Acting Presses in the past. It is an important feature of the new Farquhar Double and Triple-Acting Presses, too.
- **Best of all,** with these additional advantages, the Farquhar Double and Triple-Acting Presses are competitively priced!
- **For a more complete description** of these new Farquhar Presses with electric magnetic controls, write for Bulletin A-200. Please use your company stationery. A...B. Farquhar Division, The Oliver Corporation.

Speeds are pre-set by these radio-type dials which can be located within the main control panel or in a remote position.

FORCING • ASSEMBLING • EXTRUDING • AND OTHER OPERATIONS



*For Finer Accuracy, Higher Quality, Lower Gaging Costs!*

**DEARBORN MASTER SETTING RINGS MASTER SETTING DISCS**

When it comes to controlling internal and external work dimensions, you'll find it pays to set your production and inspection gaging equipment with Dearborn Master Rings and Discs. Produced to A.G.D. Standards, they are made of the finest quality steel . . . stabilized, ground, and precision lapped to specified size. All are subjected to rigid, 100% inspection under closely controlled laboratory conditions to assure the ultimate in uniformity and accuracy. And they are available with either steel or chromium plated gaging surfaces in a wide range of sizes to meet your particular requirements . . . Master Rings from .029" to and including 12.260", Master Discs from .150" to and including 8.510".

IF YOU BUY GAGES, Dearborn's 48-page illustrated catalog is designed to save you time. It's available to Inspection, Production, and Purchasing executives . . . send for it today!

**DEARBORN GAGE COMPANY**
*"Measuring in Millionths for Three Generations"*
**22038 Beech Street • Dearborn, Michigan**

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Look to DEARBORN for the finest in quality controlled gages!

larger capacity of 200 gal, operates to remove sludge and abrasives by use of a flat magnetic field of Alnico-5 permanent magnets. Particles remaining in liquid after contact with magnetic field are removed by gravity flow onto special filter paper which rests on an endless conveyor.

*Industrial Filtration Co, Dept 200-237, Lebanon, Ind*

**Pilot valves** added to MAC line include types actuated by hand, foot, palm-button, cam, and solenoid. Available in a variety of mountings, valves can be installed on the equipment or remotely.

*Mechanical Air Controls, Inc, 10030 Capital, Oak Park, Detroit 37, Mich*

**Footswitch** designated Series B is made of cast aluminum with a ribbed surface. Model is available in 10- and 15-amp sizes for 125-v operation. It can be furnished with cordset and series-plug or with cords and plugs to customer's specifications.

*Vemaline Products Co, PO Box 222, Hawthorne, NJ*

**Tote boxes** made of heavy-duty corrugated board called Chem-Board are available in 20 sizes. Bail handles of 7-gage steel rod flip in so that boxes can be stacked, or can move out and down for nesting boxes. Typical size—19 in. wide, 25 in. long, and 13 in. deep—weighs only 9½ lb, costs under $3 in quantities.

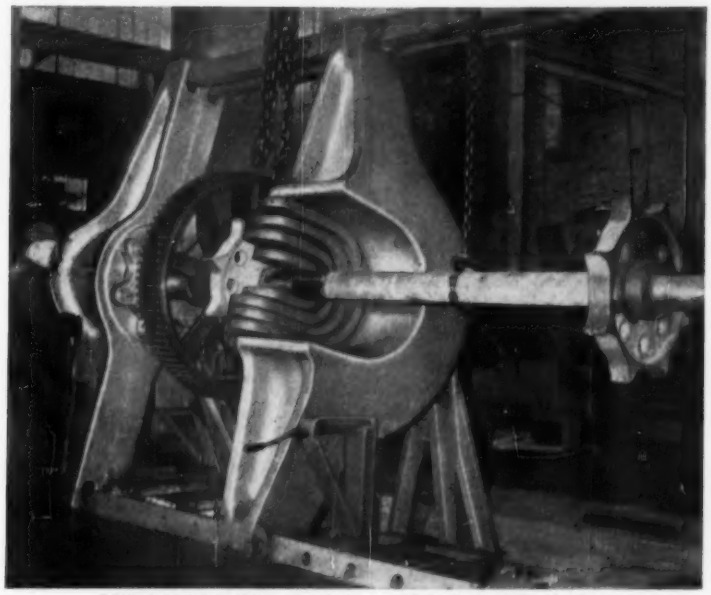
*Convoy, Inc, 3424 Navarre Rd SW, Canton, Ohio*

**Build-up electrode** called Roll Matrix is made for application as the first step in retreading carbon-steel parts which have become excessively worn. It is intended to be overlaid with a harder alloy. Recommended practice is to rebuild to a point where not more than ¼-in. thickness of hardfacing material is required. Electrode comes in core-diameter sizes of ⅛, 5/32, 3/16, and ¼ in.

*All-State Welding Alloys Co, Inc, 249-55 Ferris Ave, White Plains, NY*

**Alkaline rust remover** is designed to remove rust, paint, and primer in one dip-and-rinse operation. Material contains no cyanide compounds, requires no electrolytic equipment, and emits no corrosive fumes. Maker states that metals de-rusted with remover are no more subject to

# A MOUNTAIN of POWER



POWER FOR BIG JOBS—This Rodgers 600-Ton Inclined Forcing Press is forcing a large gear and sprocket from a mine machine shaft.

## —or a touch of pressure

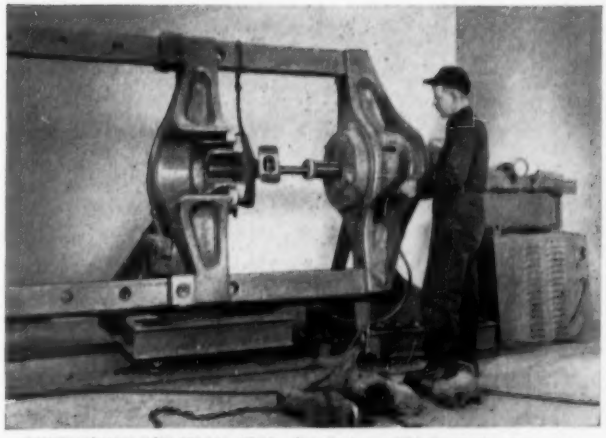
The heavy machines and equipment used in the great iron mining industry present a variety of problems when repair or maintenance is necessary. For this work the accurately controlled action of Rodgers Hydraulic Forcing Presses is a real time and work saver.

A Rodgers Forcing Press puts a mountain of power at your fingertips to force wheels, sprockets or gears from their shafts and for straightening, assembling, swedging or upsetting jobs. Operators also use the versatility, speed, power and positive control of a Rodgers Forcing Press to efficiently perform small pressing and forcing jobs with just a touch of pressure—tasks once done only on vertical shop presses!

## you get *both* with RODGERS FORCING PRESSES

Rodgers vertical, horizontal and inclined forcing presses offer capacities from 100 to 600 tons . . . up to 9 feet between tension bars . . . up to 16 feet between ram and abutment . . . single or double acting cylinders with 13 or 26-inch ram travel (72-inch travel available) . . . electrically powered hydraulic pumps with selective, positive pressure adjustment and remote control . . . removable press cylinders that can be used in special jacking or pulling jobs . . . and many more features that assure you of dependable, long life operation—all fully described in this Rodgers Catalog Number 315A.

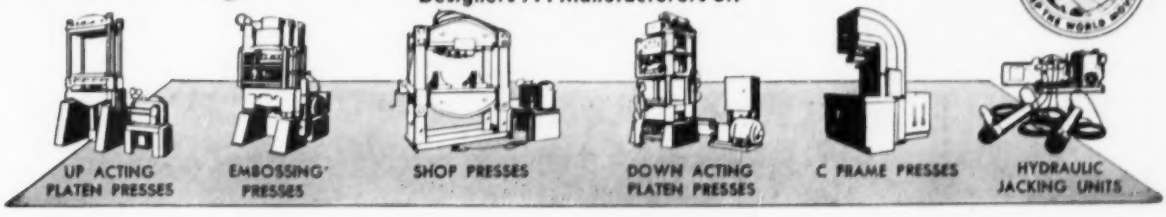
*Write for it today!*



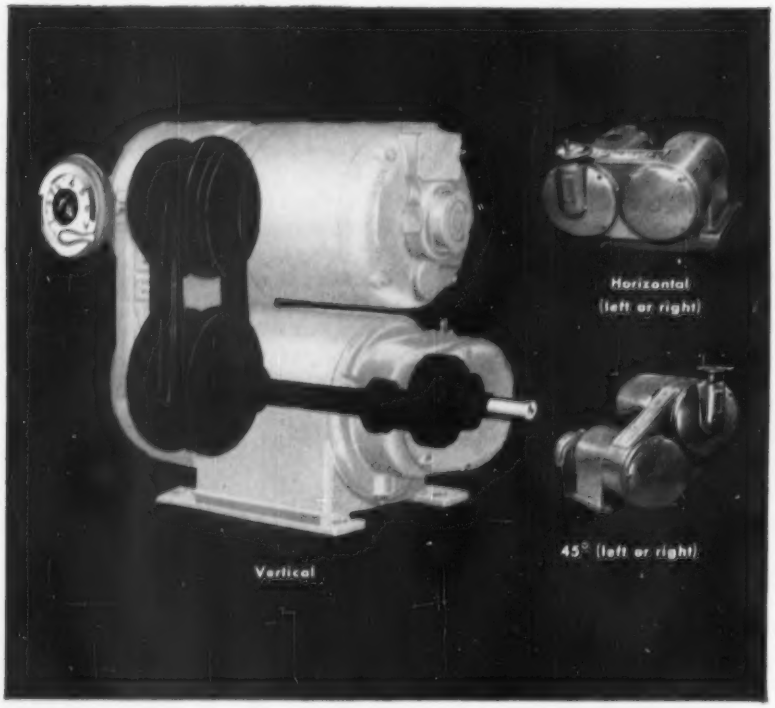
LIGHT TOUCH FOR SMALL JOBS—This Rodgers 300-Ton Inclined Forcing Press is used on small as well as large equipment repairs. Here, a pin is being pressed out of a tractor idler support bracket.

**Rodgers Hydraulic Inc.** 7407 Walker Street, Minneapolis 16, Minn.

*Designers . . . Manufacturers of:*



## A Compact Model to Fit Wherever You Need Variable Speed

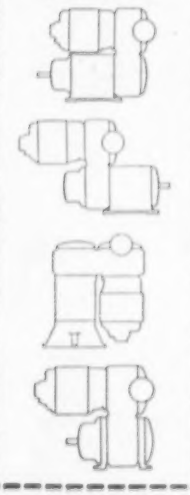



# REEVES

## FRACTIONAL *Vari-Speed* MOTODRIVE

**WHERE DO YOU NEED THE OUTPUT SHAFT?**

Motor side, control side, or vertical down



▶ REEVES fractional hp. Motodrive is a complete power package, engineered in over 100 assemblies, providing the advantages of variable speed to your machines—in minimum space.

Choose from vertical, 45° or horizontal models in ¼ to 1 hp. . . . get stepless accurate speeds—within a 2:1 to 10:1 range—from as low as 3 rpm to a maximum of 4660 rpm.

Available in standard, weather resistant, totally enclosed or splash-proof enclosures; full range of manual or automatic controls.

REEVES Motodrive—The *right* speed for *every* need . . . in *any* place.

Write Dept. A23a-M543 for ratings and dimensions.

**REEVES PULLEY COMPANY**
Division of **RELIANCE** ELECTRIC AND ENGINEERING CO.
Columbus, Indiana




rusting than is new metal. Material comes in powdered form, is mixed with water for use.

*Turco Products, Inc, 6135 S Central Ave, Los Angeles 1, Calif*

**Gearmotors** in Reliance line are available in both ac and dc from 1 through 60 hp. Alloy-steel gears are induction hardened, gear trains unencumbered by excess mechanisms. Two-way seals make possible mounting of motors in virtually any position without oil leakage. Wide selection of mountings, enclosures, and ratios is offered.

*Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio*

**Stainless steel fastenings,** formerly furnished as specials, are now available from stocks. Items include dowel pins, taper pins, wing and acorn nuts, large hex-head bolts (1-in.-dia and up), 18-8 Philips sheet metal screws and machine screws, 0-80 and 1-72 socket set and cap screws. Furnished in full range of sizes in 18-8 stainless.

*Star Stainless Screw Co, 699 Union Blvd, Paterson 2, NJ*

**Double-faced tapes,** Permacel 94 and 941, are suited as agents in many laminating and splicing operations. Tapes are made with DuPont polyester Mylar for backing. P94 is clear tape; P941 has orange-yellow adhesive and is opaque. Tapes are said to lend themselves easily to die cutting. They are available in sizes ranging from ¼ to 23 in.

*Permacel Tape Corp, New Brunswick, NJ*

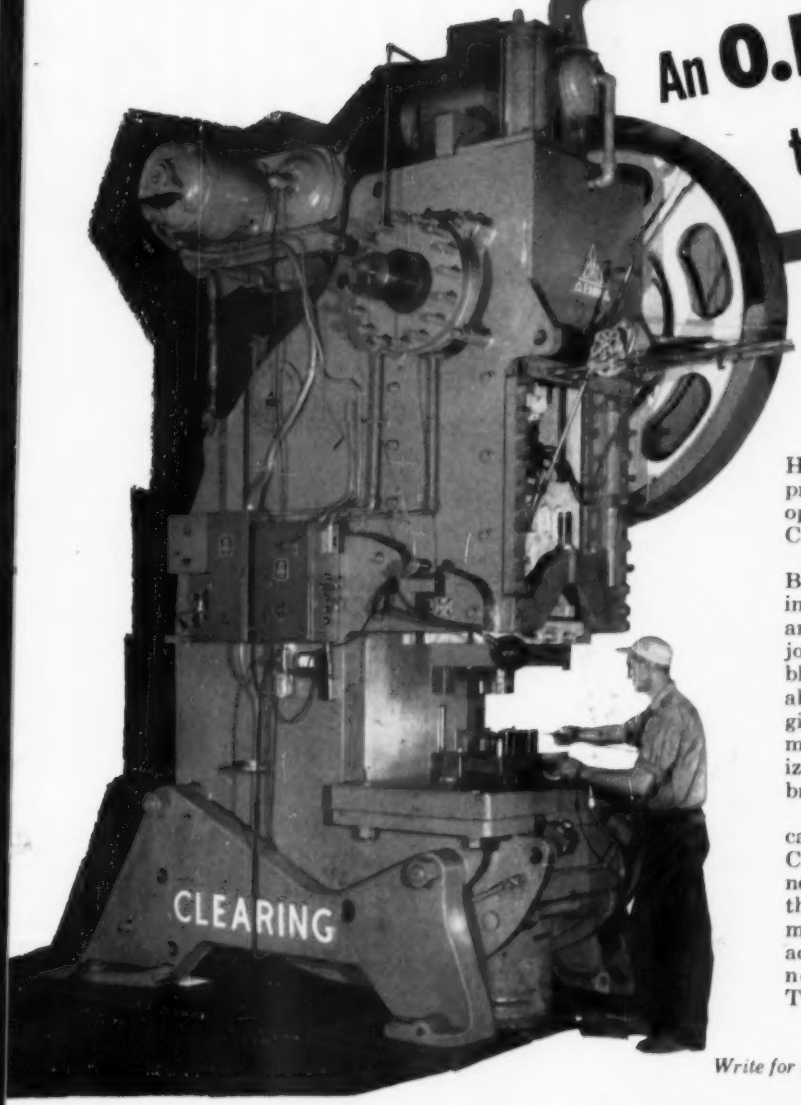
**Industrial ventilators,** Chelsea Stream-Line Penthouse units, furnished in either direct or belt-driven models, are complete assemblies including fan, housing and louver. Streamlining and sound-deadening material assure quiet operation, and a coating of bituminous compound provides weather protection. Units are available in sizes from 12-in. to 60-in. (1300 to 40,500 cfm) with ball-bearing motors ranging from ⅛ to 3 hp.

*Chelsea Fan & Blower Co, Inc, 639 South Ave, Plainfield, NJ*

**Protective-film sealers** in Kenvert line are designed to provide protection for common non-ferrous metals against tarnish, stains, fingerprints, and inside corrosion. Sealers report-

(Continued on page 236)

# An O.B.I. that takes on the BIG JOBS




## Ask Warner about their New CLEARING

Here's a big press—200 tons capacity—with big press features combined with the convenience of operation and easy feeding found in every Clearing O.B.I.

Warner Electric Brake & Clutch Company, Beloit, Wis., uses this press for drawing and forming parts for their broad line of electric clutches and brakes. They wanted quick changeover from job to job, versatility in feeding, the ability to blank or draw, automatic lubrication and variable speed drive. Their 200-ton Clearing O.B.I. gives them these things and more—hands-off maintenance, air cylinder counterbalance, motorized slide adjustment and air friction clutch and brake.

If you want a high production machine that can take on the big jobs, ask Warner about their Clearing O.B.I. Better still, ask Clearing engineers. They'll help you select the machine that can give your manufacturing operation exactly the kind of support it needs. Call in Clearing. There'll be no obligation.

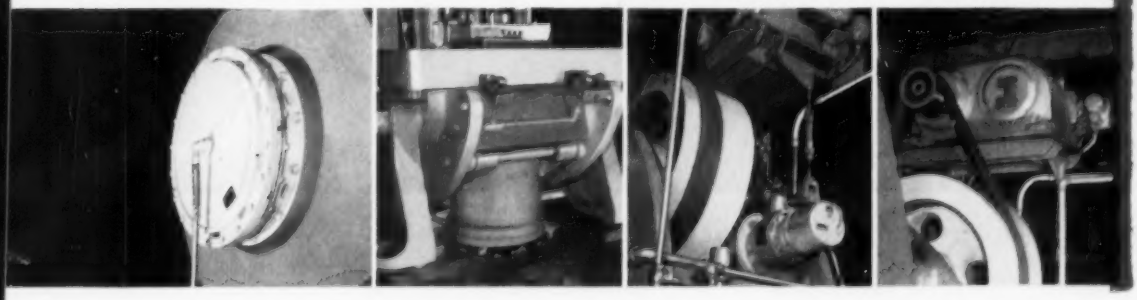
*Write for complete catalog on Clearing O.B.I.'s.*

This 200 ton press is equipped with Clearing's low-maintenance air friction clutch.

Clearing 31 ton cushion provides blankholding or lift-out pressure as required.

Each press stroke automatically lubricates the machine. Power slide adjustment is also provided.

Variable speed drive provides high speeds for blanking—medium speeds for drawing operations.

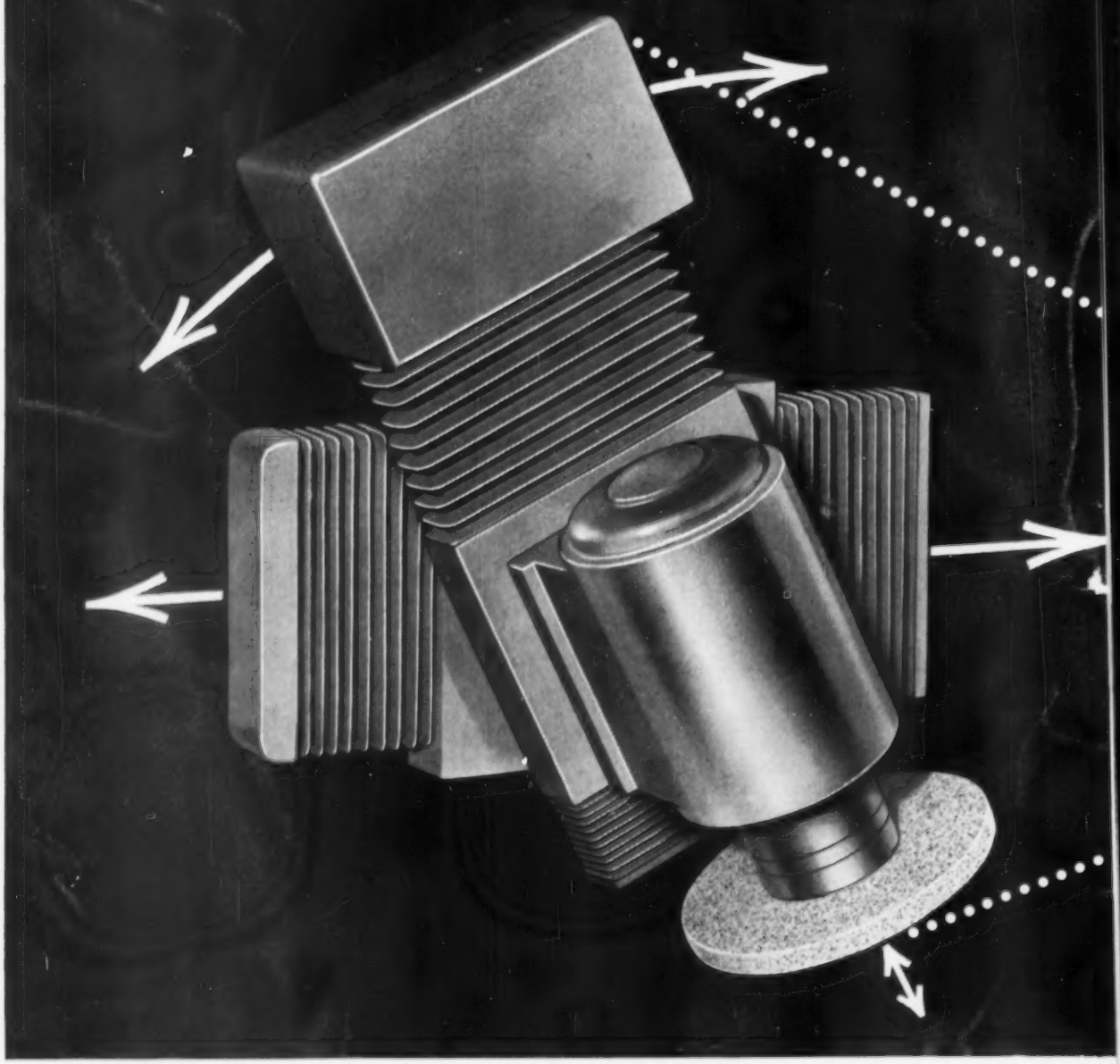


**CLEARING PRESSES** THE WAY TO EFFICIENT MASS PRODUCTION

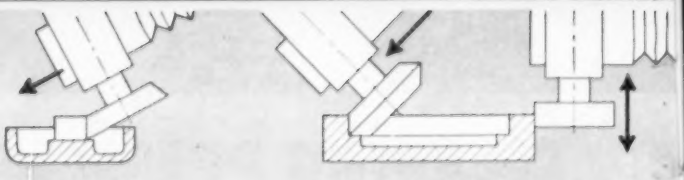
**CLEARING MACHINE CORPORATION** • *Division of U.S. INDUSTRIES, INC.*

**6499 W. 65th Street, Chicago 38, Illinois • Hamilton Plant, Hamilton, Ohio**

# PRECISION GRINDING



Diagrams show typical applications of Frauenthal Standard Slide Units to a variety of grinding problems.



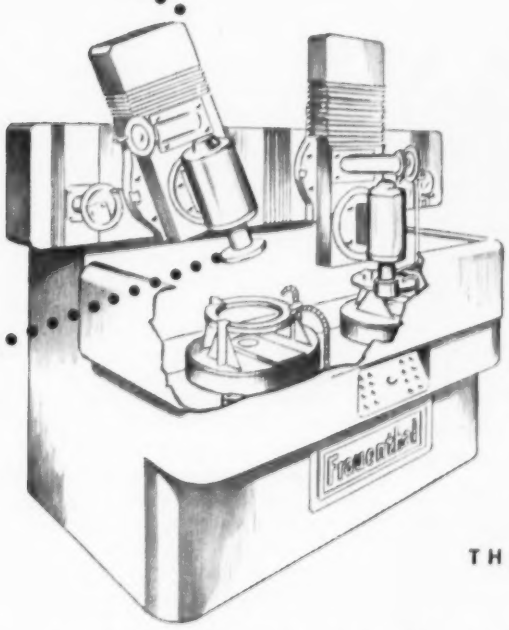
# at any angle!

## Frauenthal's creative engineering Now makes available Standard Slide Units in any number of combinations for production grinding applications . . .

IT IS NO LONGER NECESSARY to absorb special engineering and design costs when Frauenthal Standard Slide Units — plus a variety of grinding spindles — can be assembled to machine bases appropriate to a particular job. And these standard slides in single or multiple units can be arranged in an infinite number of spindle positions to accommodate an endless variety of simultaneous or sequenced, automatically controlled grinding operations.

What's more, you get all the advantages of Frauenthal's advanced engineering and design experience—proven on single and multiple-head grinders used on special production jobs. For example: parts for jet engines, diesel and automobile engines, tanks, gun mounts, radar units, large and small diameter precision bearings and machine tool components.

As illustrated here, this model of the versatile grinding compound shows how the Frauenthal Standard Slide Unit can be adapted to approach the work from any desired angle.



Here's a typical Frauenthal Double Head Vertical Spindle application utilizing two of the Frauenthal Standard Slide Units shown on the opposite page. Although applied to a particular grinding situation, these slide units retain versatility for angular positioning. Frequently, as indicated in panels 2 and 4 at the bottom of the page, diameters and adjacent surfaces are ground at one time with a single wheel dressed to the proper contour.

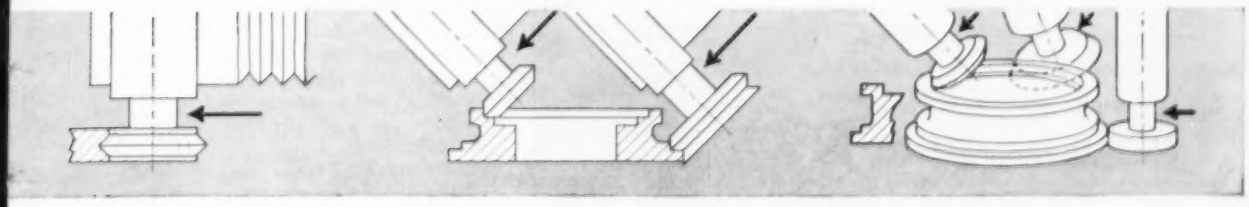
**Send a print of your "problem grinding part"** and our engineers will show you how to apply Frauenthal Standard Slide Units to solve the problem. Include in your letter pertinent production information — number of pieces, etc. Be sure to investigate the latest Frauenthal Vertical Grinders with Standard Slide Units. For complete details, contact Frauenthal of Muskegon.

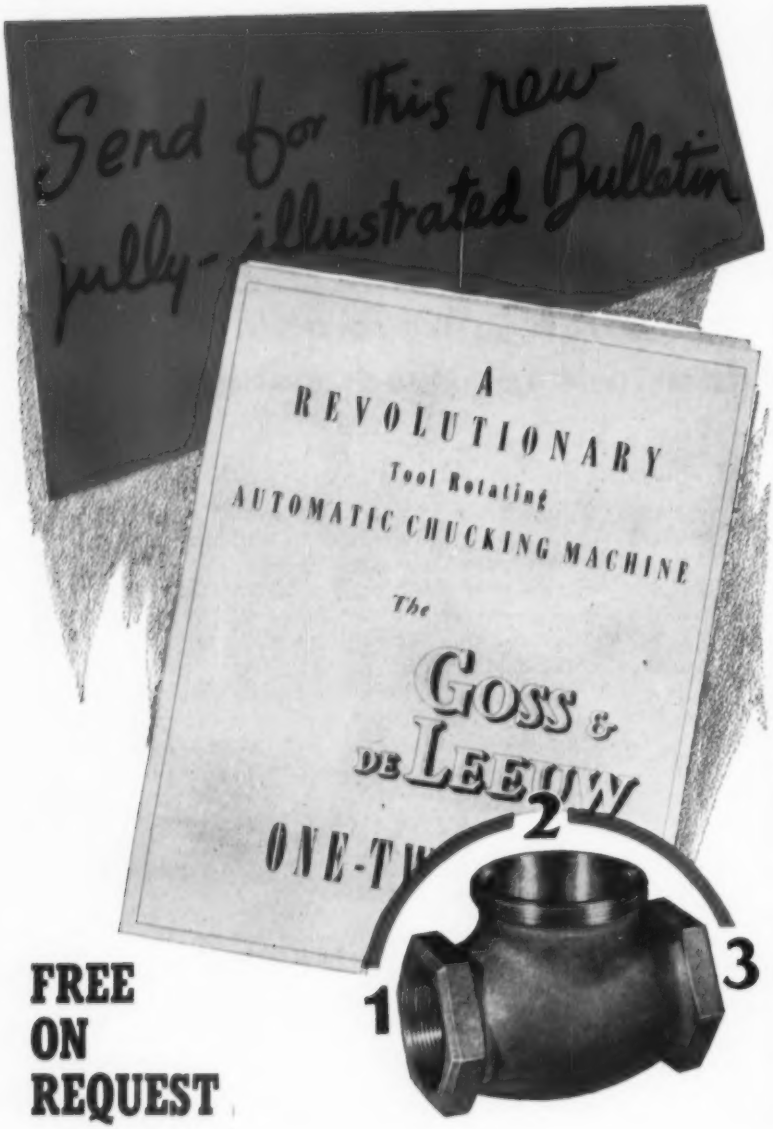
**Frauenthal Division**

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN, U. S. A.

F-256






**FREE ON REQUEST**

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously—without changing set up.

*Get this interesting, informative Bulletin NOW—by merely asking for it.*

**GOSS and DE LEEUW**
**MACHINE COMPANY, KENSINGTON, CONN., U.S.A.**

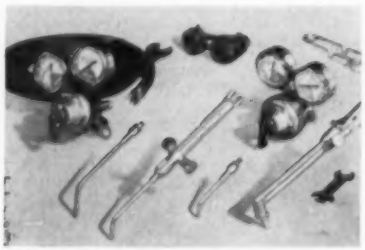

## NEW SHOP EQUIPMENT

edly increase the adhesion of organic films by preventing the formation of metallic soaps. They are particularly recommended where paint or lacquer film has been giving premature failure in the presence of moisture.

*Conversion Chemical Corp, Rockville, Conn*

**Industrial glove** made of non-absorbing butyl rubber compound and designed to protect the hand from destructive agents such as sulphuric, nitric and phosphoric acids, oxygen, oils and salts, is available in a one-fingered model with reinforced seams and crotch and a rough stippled finish.

*Hood Rubber Co, Watertown, Mass*



LIGHT-RANGE WELDING AND CUTTING OUTFITS, designated Prest-O-Weld Aircraft and Prest-O-Weld Light, contain company's W-120 welding blowpipe and CW-120 cutting attachment. Only difference between models is in regulators and hose lengths. Three welding heads and one cutting nozzle are provided with each outfit. Six additional heads for blowpipe give welding range from 32-gage to ⅜ in. Two extra cutting nozzles extend range of cutting attachment to 2-in.-thick iron and steel—*Linde Air Products Co, Div of Union Carbide & Carbon Corp, 30 E 42nd St, New York 17, NY*

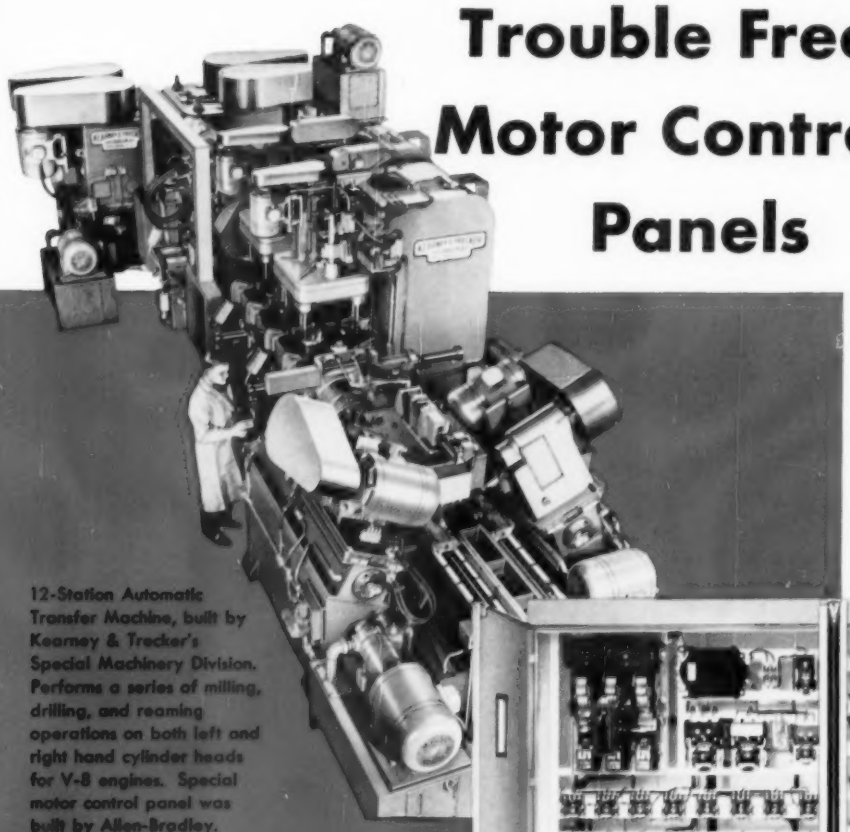
**Powered vises** called Airlox are used to hold fixtures on machine tools, on welding operations, or on assembly where 1200 lb or less is adequate force on the work. Devices can be used singly or in series, horizontally or vertically, and with manual or automatic controls. Head has a guided, air-operated, movable jaw with 1-in. stroke and return. Developed push is 12½ times air-line pressure. Price, complete with hand or foot valve and air hose assembly, is $67.50 fob.

*Production Devices Inc, Whitehall, NY*

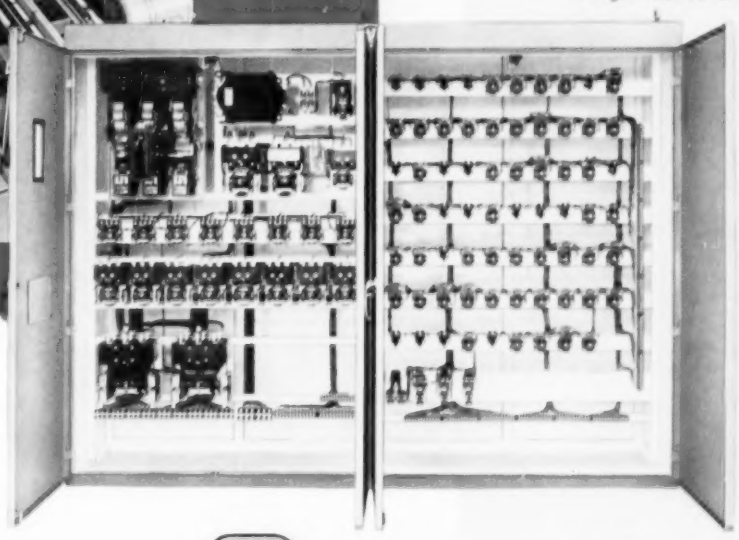
# Satisfied Customers

## RESULT FROM THE USE OF

# Trouble Free Motor Control Panels



12-Station Automatic Transfer Machine, built by Kearney & Trecker's Special Machinery Division. Performs a series of milling, drilling, and reaming operations on both left and right hand cylinder heads for V-8 engines. Special motor control panel was built by Allen-Bradley.

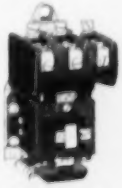


Bulletin 849
Pneumatic Timer

Bulletin 709
Automatic Solenoid Starter

Bulletin 802T
Oiltight Limit Switch

Bulletin 800T
Oiltight Push Button



Bulletin 702
Solenoid Contactor

Bulletin 700
Solenoid Relay

You get two definite advantages when you let Allen-Bradley furnish your special control panels, namely—trouble free, continuous reliability plus ready customer acceptance.

Allen-Bradley control panels are built from standard components whose reliability and maintenance free operation have been proven in many years of service. Their simple design is your guarantee of millions of trouble free operations. The familiar A-B trademark—recognized universally as the sign of QUALITY—is a decided sales asset on your equipment.

Write for your copy of the Allen-Bradley Handy Catalog—the quick and easy reference guide that will help you select individual control units, or components for special control panels.

7-56-R

A-B Quality

**ALLEN-BRADLEY**

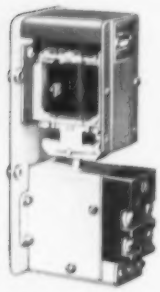
MOTOR · CONTROL

QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

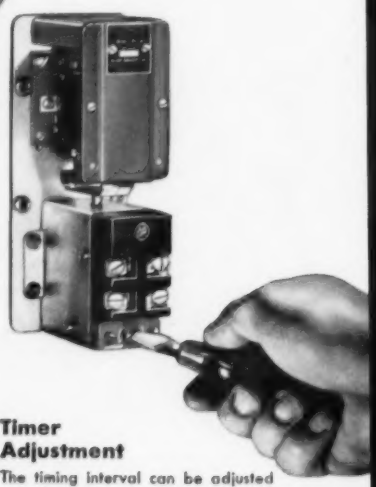
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

# TIMING RELAYS!



Bulletin 849 "On-Delay" timer. By inverting solenoid, timer is converted to "Off-Delay" operation.

Installing instantaneously operated contact block with one N.O. and one N.C. contact



**Timer Adjustment**

The timing interval can be adjusted quickly and easily by turning the adjusting screw.

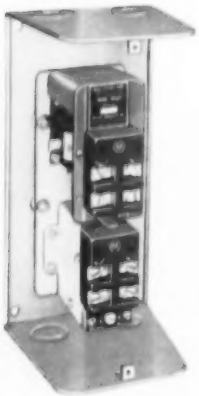
## *Tell Us About YOUR TIMER NEEDS . . . Allen-Bradley Has the RIGHT ANSWER!*

Here is a line of pneumatic timers that can be adjusted for a consistent time delay of 1/6 second up to 3 minutes. Air, drawn into the timer through a needle valve, is freed from dirt and dust down to submicroscopic size by a high efficiency glass fiber paper filter. Thus the time settings are accurately maintained over long periods. These timers can be expected to operate reliably under conditions of severe atmospheric contamination.

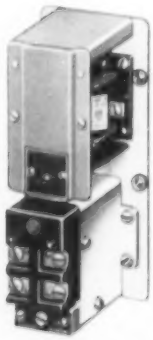
An outstanding feature of these timers is the wide variety of types available, and the modifications which can be made in the field, such as adding one or two instantaneously operated auxiliary contacts. Also, it is easy to change an "On-Delay" timer to the "Off-Delay" operation, or vice versa—by simply inverting the operating solenoid. The "On-Delay" timer provides the time delay *after* the magnetic operating COIL IS ENERGIZED; the "Off-Delay" timer provides the time delay *after* the operating COIL IS DE-ENERGIZED.

The Bulletin 849 timer has one normally open and one normally closed contact. As usual, the Allen-Bradley double break, silver alloy contacts are maintenance free. Auxiliary contacts can be mounted as shown below.

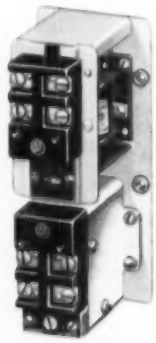
## A few typical Bulletin 849 Pneumatic Timer combinations



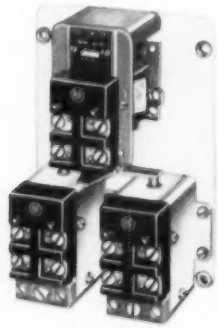
Bulletin 849 timer with one N.O. and one N.C. auxiliary contact.



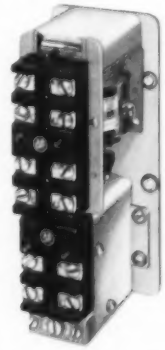
Bulletin 849 "Off-Delay" pneumatic timer with time delay *after* the coil is de-energized.



Bulletin 849 "Off-Delay" pneumatic timer with one N.O. and one N.C. auxiliary contact.



Bulletin 849 "On-Delay" pneumatic timer with two adjustable timing units.



Bulletin 849 pneumatic timer with two N.O. and two N.C. auxiliary contacts.

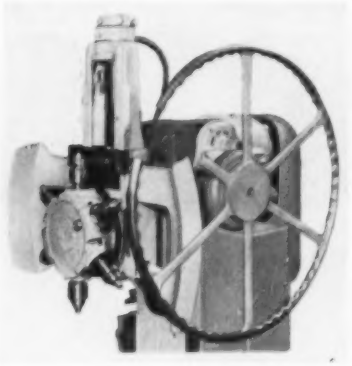
Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

**ALLEN-BRADLEY**
QUALITY
**PNEUMATIC TIMERS**

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

7-56-MR

HYDRAULIC CIRCUIT TESTER, Model PT-50-B, weighs only 19 lb, is contained in small case. With pressure range of 30 to 2000 psi, max flow of 50 gpm, and temperature gage reading from 60 to 220 F, device simultaneously measures temperature, pressure, and flow from any component port in a hydraulic system—*Schroeder Bros Corp, 3116 Penn Ave, Pittsburgh 1, Penna.*



POWER FEED called Burgmaster, with range of ½ to 6 ipm, fits hand-operated Burgmaster turret drills 2A, 2B, and 2BR, can be installed in 2 to 3 hr on machines in field. Unit has power to drive ¾-in. drill in mild steel. Compact unit consists of control panel, feed-engagement switch, depth stop bar, and power-feed handle assembly—*Burg Tool Mfg Co, Inc, 15001 S Figueroa St, Gardena, Calif*

**Permanent-magnet separator** called Rota-Grate is a rotating cylindrical grate designed for installation at the discharge of open or enclosed chutes, or in open or closed duct systems, for magnetically removing pieces of tramp iron, at the same time preventing clogging or bridging of material through the mechanical action

(Continued on page 241)


**Abrasive Cutting** | *the best way to cut many materials the only way to cut some*

# Campbell Cut-Off Machines

"Cutting 20-foot tubes of stainless steel into 1" to 17" lengths

### Slice $32,000 a year from tube cutting costs

• Because CAMPBELL Abrasive Cut-Off Machines not only cut stainless steel tubes twice as fast as former methods—but the clean cut saves a deburring process—Ryan Aeronautical Company saved $32,000 the first year of its operation.

Ryan uses thousands of pieces of this stainless steel tubing each month in ball-and-socket joints, nipples and sleeves of exhaust systems. They must be precision-cut from 20-foot pipe in lengths from 1 to 17 inches.

The smooth-finish cut of the CAMPBELL Oscillating Wet Abrasive Cut-Off Machine is extremely accurate — with no hard spots, no change in metallurgical characteristics. It results from the WET cut with abundant coolant supplied just where it will do the most good. Speed and economy come from the OSCILLATION of the abrasive wheel . . . the right one for the job.

### Some additional performance figures

Smooth cutting on CAMPBELL Oscillating Wet Abrasive Cut-Off Machine saves an extra grinding operation on gear tooth samples cut for metallurgical study.

International Nickel's tough K Monel, 4¼" dia., is cut in 2 minutes per cut on a CAMPBELL Oscillating Wet Abrasive Cut-Off Machine.

### How to get expert advice on your cutting problems

• CAMPBELL Engineering Service costs you nothing—can save you much. Does your metal cutting problem involve cutting of alloy or high carbon steel? Our Field Engineers are abrasive cutting specialists. They can help you arrive at just the right combination of a CAMPBELL Cut-Off Machine and ALLISON Cutting Wheel that will improve your operation and save you money.

*Let us send you this book*

ACCO

Campbell Machine Division

AMERICAN CHAIN & CABLE

923 Connecticut Avenue, Bridgeport 2, Connecticut

# Mr. Smith goes to Florida!

Mr. Smith's books showed an excellent current ratio. His cash position was good; his surplus was substantial. Shortly thereafter, however, he entered a premature retirement.

He had overlooked the fact that a large part of his company's fixed assets were machine tools, and their values shown on his balance sheet were simply bookkeeping entries. Those values didn't reflect obsolescence, nor show how expensive indirect labor, nonproductive floor space and downtime can be.

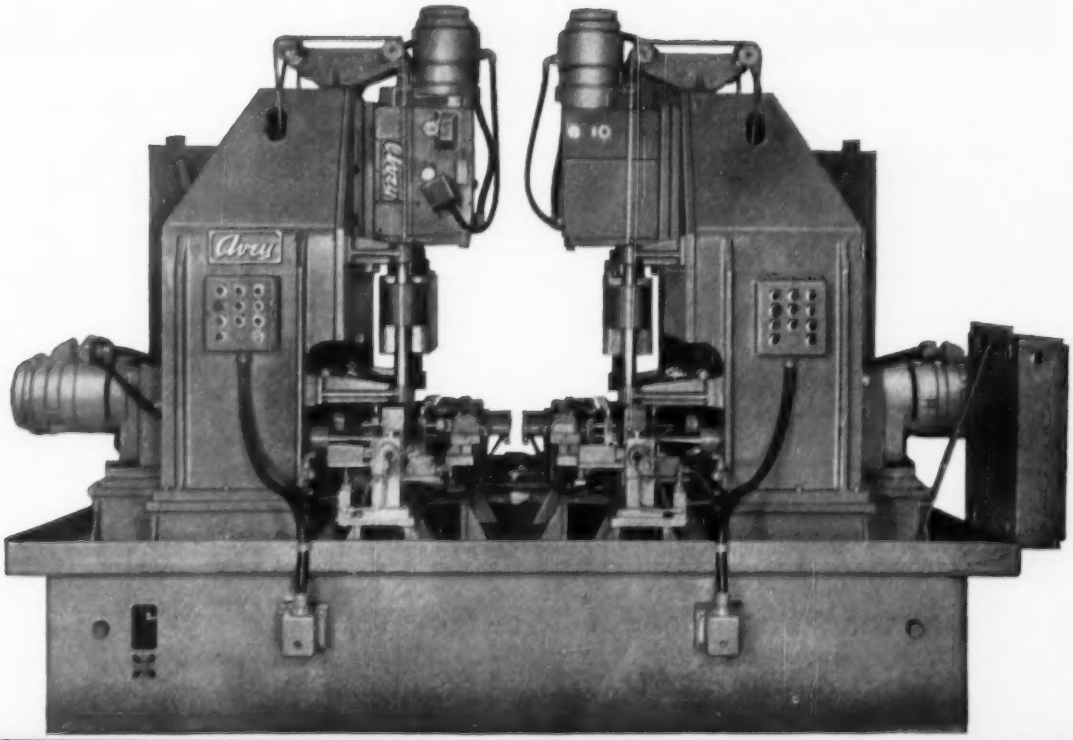
A closer look at your balance sheet may reveal the wisdom of investing in new production equipment. Its high rate of return makes good balance sheets better.

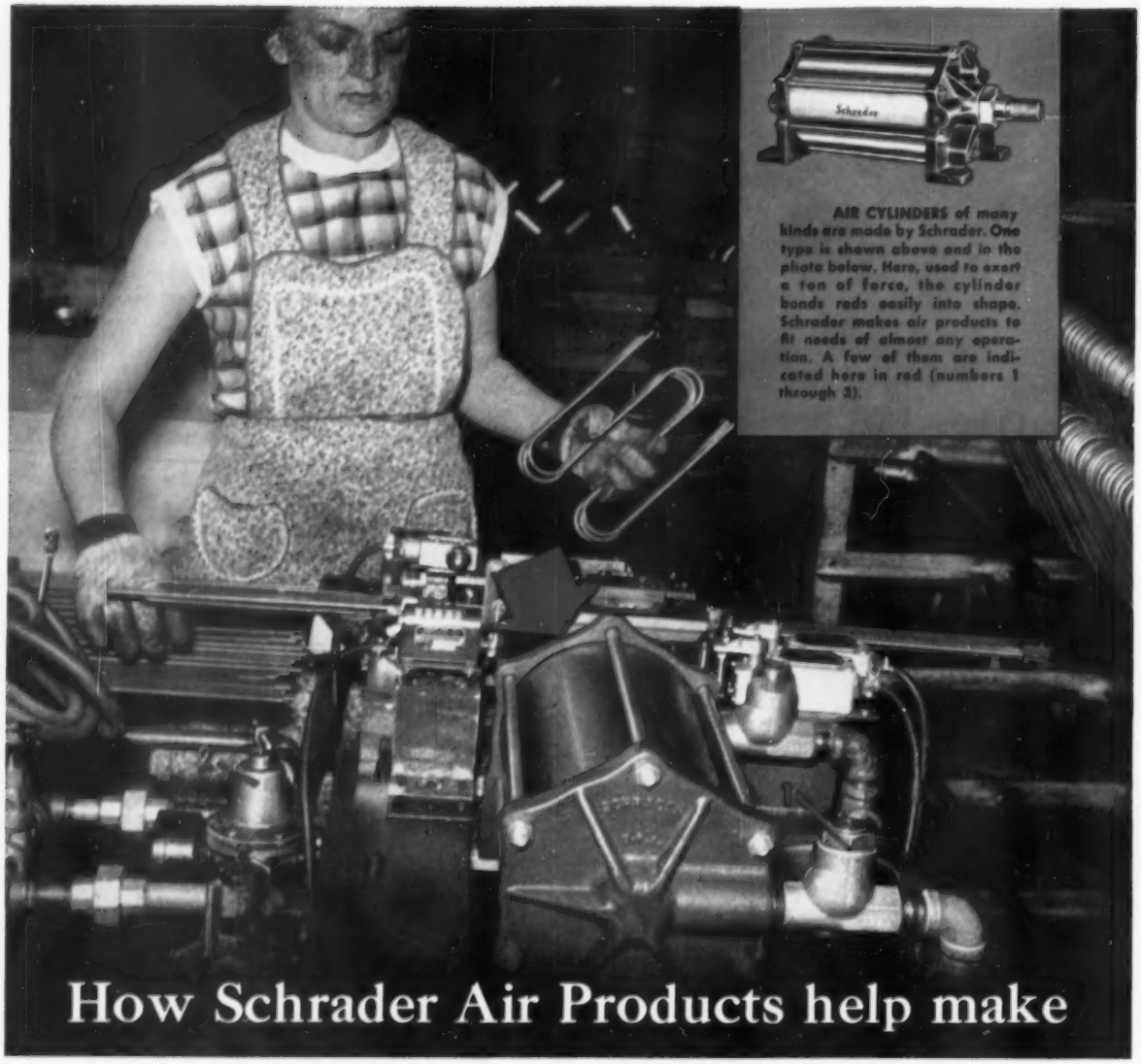
▸ **production data:** —This Avey Line-O-Dex drills and deburrs 3100 body sleeves per hour. On each half of machine, 3 parts at a time are indexed automatically; hydraulically clamped; drilled and deburred. Built to JIC specs except for 2-speed motors, which increase production.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

**drilling, tapping, production machines**

Avey







**AIR CYLINDERS** of many kinds are made by Schrader. One type is shown above and in the photo below. Here, used to exert a ton of force, the cylinder bends rods easily into shape. Schrader makes air products to fit needs of almost any operation. A few of them are indicated here in red (numbers 1 through 3).

# How Schrader Air Products help make

## *4 times as many burner grills per hour*

Bending metal rods for kerosene burner grills requires a ton of force at Barridon Oil Burner Corporation in Hartford, Connecticut. Before air was adapted to the job, only 150 pieces per hour could be produced. Now, with the help of Schrader Air Products, 620 pieces are produced every 60 minutes.

This kind of production help is typical of operations automated with Schrader Air Products. Every day, new ways of using air for automatic operations are being planned, tested, and integrated in many different kinds of manufacturing plants. Economy, efficiency, and safety are basic with air, and in many cases air has made the difference between profit and loss.

Schrader engineering facilities are available to help you. Upon request, Schrader engineers will assist in planning for the most efficient use of air in your plant. Outline your problem to us and we'll give you prompt help. Right now—send for the latest informative booklets which show Schrader Air Products that can increase production, at low cost.

**Schrader**®
ESTABLISHED IN 1844

A. SCHRADER'S SON
*Division of Scovill Manufacturing Company, Incorporated*
460 Vanderbilt Avenue, Brooklyn 38, N. Y.

FIRST NAME IN THE USE OF AIR
FOR INDUSTRIAL PRODUCTION AND CONTROL

of its rotation. Device is composed of multiple stainless-steel Alnico-V tube magnets mounted horizontally between stainless-steel plates, the entire assembly rotating around a central shaft which accommodates a drive pulley. Standard diameters of 12, 16, and 22 in. are available, with 10, 15, and 20 magnetic tubes.

*Eriez Mfg Co, Erie 6, Penna*

**Overload warning signal** designed for attachment on company's sit-down industrial trucks warns driver either by signal light (or optional bell) that load is in excess of safe operating capacity of truck. Device will also warn driver when load shifts to a dangerous position. Unit incorporates vacuum switch and bell or light; switch is attached to hydraulic system on which steer wheels are mounted. Installation price at factory or dealer is $75.

*Lamson Mobilift Corp, Portland, Ore*

**Carbide dowel-pin reamers,** designed for reaming operations in die-hardened steel from 45 to 65 C Rockwell, are said to eliminate need for grinding, lapping, or honing. According to company, dowel-pin holes can be drilled undersize, piece hardened, and hole reamed accurately to size. Reamers are available in diameters of ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

*Whitman & Barnes, 40600 Plymouth Rd, Plymouth, Mich*

**Diamond lapping compound** packaged in 5- and 20-gram units is ready for instant use, and is usually applied to surfaces by means of a suitable gun. Diamond-carrying vehicle of the compound is soluble in water or commercial solvent, reportedly has no tendency to thin out with heat or thicken and roll up under usage. Diamond particles are said to be exceptionally uniform in size.

*Di-Met Corp, 1873 Mullin St, Torrance, Calif*

**LP-gas conversion kit** for all makes of industrial lift trucks is said to make conversion possible in only 3 or 4 hours. All lines, fittings, and carburetion assembly are mounted for bolt-on arrangement. All parts are made to proper size and are clearly identified. Kit comes complete with fuel cylinder bracket, toggle and strap to hold cylinder in position, and location pin to carburetion linkage.

*Industrial Gastruck, Inc, 2019 Dempster St, Evanston, Ill*

Which BUSHING SHOULD YOU USE?

Your choice is getting broader every day. Each of the guide pin bushings above is good—in the right application. But, some of them cost more than others. Which should you use for best results consistent with cost?

That's where Detroit Die Set can help you. In our 25 years of exclusively building die sets, we've tested a good many types of bushings. Based upon these tests and performance in our customers' plants, we stock and recommend a number of types of bushings for use in our die sets.

To aid you in bushing selection, we've prepared a bulletin on the subject. Just ask for Bulletin 56, and we'll send your personal copy without delay. Detroit Die Set representatives also will be glad to personally aid you in selecting the right bushings and die sets. They're as near as your 'phone.

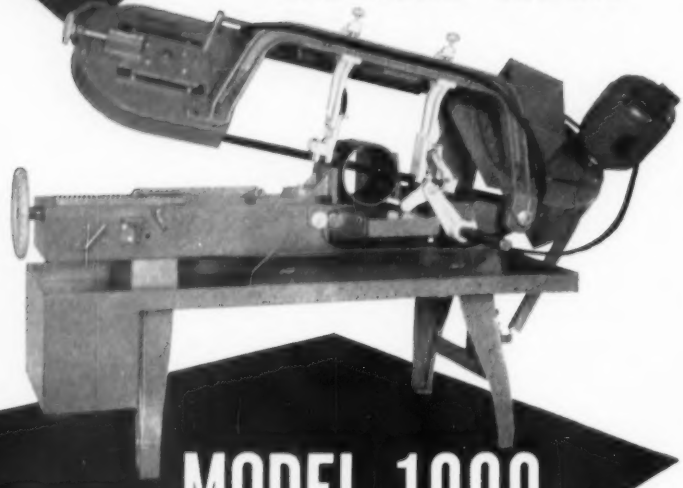
*Offices in Principal Industrial Centers*

Detroit DIE SET CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

*Announcing*

**A NEW PRODUCTION TOOL FOR METAL CUT-OFF**



**THE WELLS MODEL 1000 HORIZONTAL METAL CUTTING BAND SAW**

● Here's the newest in the Wells quality line of metal cutting band saws—The Model 1000, a big capacity production machine . . . modestly priced.

The structural rigidity necessary for better cutting and operation is provided by the rugged counterbalanced frame and guide beam and special heavy duty blade guides. The use of a 1" blade assures further accuracy and efficiency for your production cut-off operations.

Like other Wells saws, the Model 1000 features the exclusive Wells "constant load" blade tensioning device, four selective speeds, hydraulic frame check and optional wet cutting system.

Equipped with the Wells-O-Bar Feed Master, this saw easily converts to an automatic cut-off machine. See your Wells Distributor, or write for full details.

**SPECIFICATIONS**

| | |
|---|---|
| Capacity: Rounds | 10" dia. |
| Rectangular | 10" x 16" |
| Extra Capacity (end cuts up to 7½"): | 11" dia. |
| Speeds: Selective, f.p.m. | 50, 100, 175, 275 |
| Motor Size | ¾ HP |
| Swivel Vise | to 45° |
| Blade Size: | 1" x .035" x 11'-6" |
| Height to top of bed | 25½" |
| Width of bed | 10¼" |
| Floor Space | 24" x 72" |
| Shipping Weight—approximately | 655 lbs. |
| With Coolant | 705 lbs. |

Wells saws

**Wells**

*The Pioneers of Horizontal*

**METAL CUTTING BAND SAWS**

WELLS MANUFACTURING CORPORATION
505 Roosevelt Rd. Three Rivers, Michigan


## NEW SHOP EQUIPMENT

**Hard-surfacing wire** for automatic and semi-automatic operations is called Tube-Alloy. Copper-coated, alloy-filled wire is available in six types for various applications. Copper coating provides positive contact, prevents surface rust. Bulletin is offered.

*McKay Co, 316 McKay Bldg, Pittsburgh 22, Penna*

## ROUND TABLE *Discussion*

### SALESMAN FOR A DAY

*Is there anything to be gained by a machinist going out with a salesman for a day? Will he increase and broaden his conception of the product on which he works, or will it be a waste of time?*

A LOT of production workers have the mistaken idea that the salesman is a fast-talking guy in fancy clothes who's vastly overpaid for peddling a product that's so good it would sell itself anyway.

That's the way I would sum up the shopman's view of his firm's salesmen. And I know whereof I speak, because I have been both production worker and salesman. That is why I believe it would be a good idea to expose some of these scoffing production men to the real facts. They might have a little more respect for the salesman whose efforts are keeping them working, and a better knowledge of how to improve the product they are making. Send some shopmen out as "salesmen for a day"; the experience will be well

*"He learns slow, but once you show him how, he'll remember it for hours."*

worth the expense. The broader knowledge of the company's operations will certainly improve shop work.

Modern management, through its industrial relations program, is well aware of the benefit of giving employees an idea of what their fellow-workers in other departments do for a living. I know of an adding machine manufacturer who occasionally sends out one of his screw machine operators, a milling machine operator, or an assembler, to go along with the sales staff for a day to see what it takes to sell adding machines. The manufacturer is convinced of the long range benefits of the salesman-for-a-day idea. He feels that here's a chance for his shopman to know what it takes to make a product that will sell, and see what it takes to sell it. The worker is sure to get a new slant on the importance of what he is doing to give the salesman a break in ringing up a sale instead of no sale. The shopman's reactions as he sees his product's end use in customers' and prospects' offices, and the effort it takes to sell it, will be a powerful stimulus to make the best product. Too many production workers have the idea that they are not supposed to know about the finished product, or its workings and use. They make parts for something they never see or use when finished. Too many lack the spirit of cooperation because they are pitifully ignorant of the part played by other workers in other departments in making the company's product a best seller with mutual benefit for all employees. Too many production workers have a narrow attitude about the salesman.

It's a fallacious argument to claim that the salesman-for-a-day idea is a new way of wasting time; that it's unnecessary for the shop man to know how his fellow-worker goes about the business of selling the product. I'll bet that the production workers who go out with company salesmen pounding the pavements, calling on customers and prospects, won't have a low opinion of the salesman's efforts and ability necessary to sell the product. A salesman's got to be able to take it, and he has to be good to keep the company in business. And that means, as far as the production worker is concerned, that the product he sells has got to be good or better than his competitor's or the company may cease to be an employer and the shop man an employee.

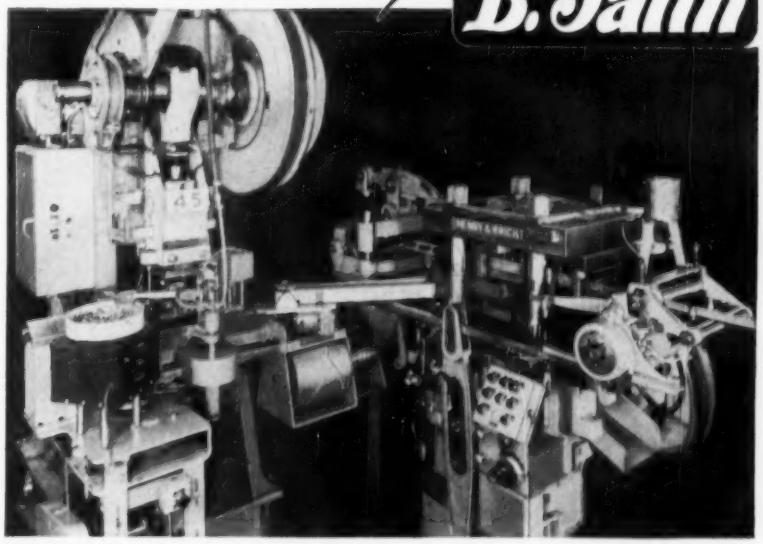
The salesman-for-a-day idea will certainly encourage constructive thinking for product betterment and


**2 PRESSES . . . 1 PROGRESSIVE DIE . . . 1 STIPPLING DIE . . . ENGINEERING INGENUITY . . . SPECIAL MACHINERY . . . SPECIAL ELECTRICAL COMPONENTS . . .**

*produce*

**AUTOMATION**

*by* **B. Jahn**



Here's true automation — 100% automatic production, 100% B. Jahn built, that transforms .025" aluminum into precise meter components 3⅝" in diameter — each with 720 teeth .009" deep — without human hands, human error!

Equipped with B. Jahn progressive die, one 60 ton press was linked by a chain drive to a 45 ton press incorporating a stippling die.

Progressive die, ground all over to guarantee greater accuracy, longer service, less downtime, pierces and blanks intricate discs.

Conveyor system feeds disc into air-operated vacuum arm that positions piece in B. Jahn stippling die. Another arm removes stippled piece and places it on stacking unit.

Completed discs, at the rate of 30 per minute, are automatically stacked and spaced on spindle. Here's true AUTOMATION, true production economy!

Get Full Details On This Astounding "No Hands . . . No Delay . . . No Error" Automation Application — Send Today for the Big New B. Jahn Brochure.

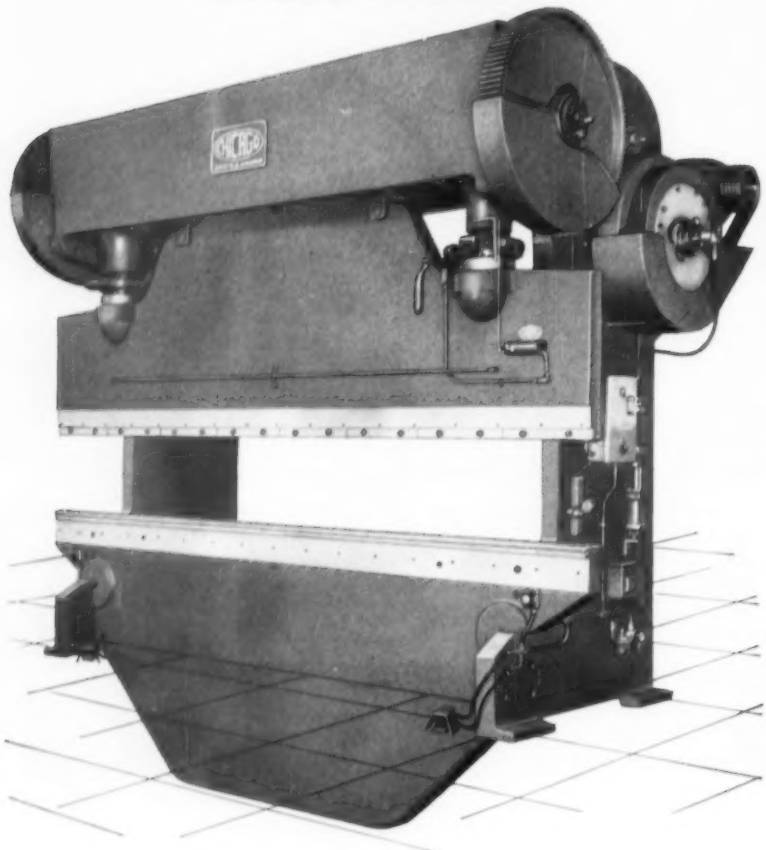
**B. Jahn**

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

CHICAGO
DREIS & KRUMP

# Press Brakes

## FOR BENDING · FORMING STEEL PLATES



The most modern design throughout with all the features for the fastest bending and forming of steel plates. Large variety of standard sizes and capacities. Also modified designs for special production work.

*Complete Engineering Recommendations for Any Job on Request* 6150

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side Presses • Press Brake Dies

Hand and Power Brakes • Special Metal-Forming Machines

**DREIS & KRUMP MANUFACTURING CO.**

**7434 South Loomis Boulevard, Chicago 36, Illinois**

employee cooperation. It's well worth a try.

Harry Kaufman
*Philadelphia, Penna*

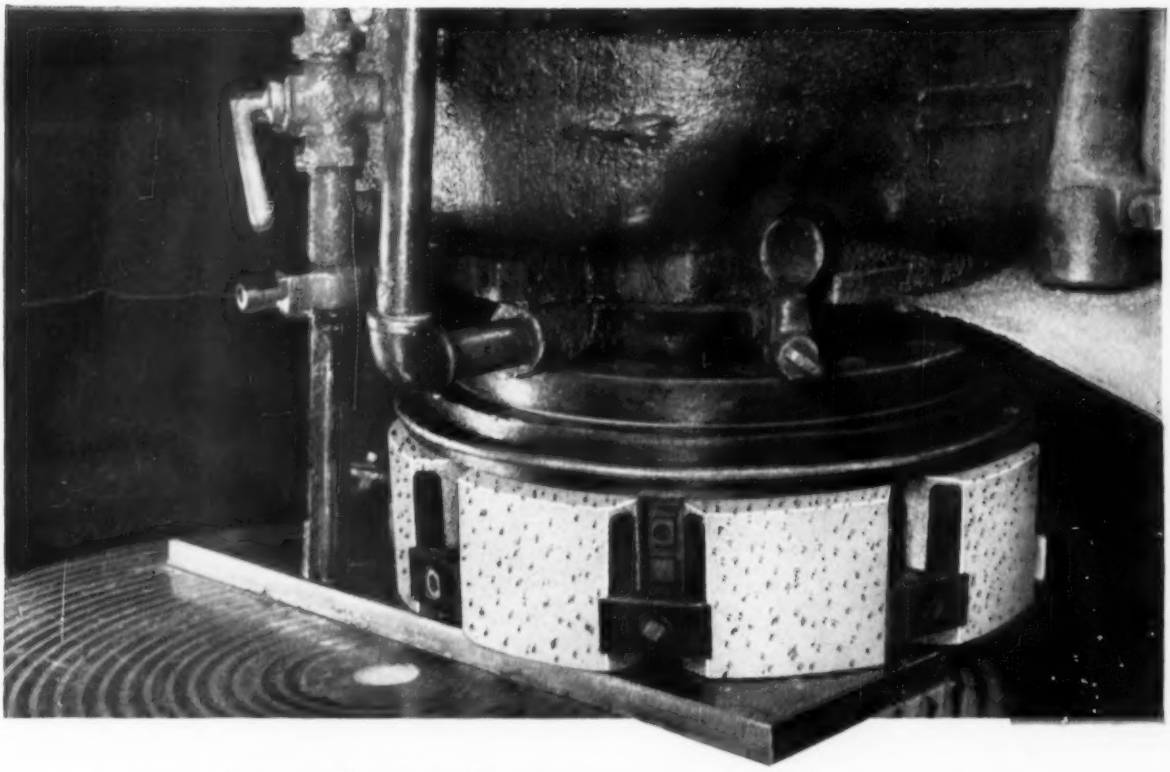
### SALESMAN FOR A DAY

SENDING A SHOPMAN out to sell the company product cannot serve any useful purpose. The shopman has his own problems and is not interested in anyone else's. What is the purpose? To show him that it is difficult to sell their product, or to show him what a poor salesman he would make? In any case it would be difficult to convince the man that it can serve any useful purpose, and most shopmen would really fight against such a move. If they did go out, who is to know if they even attempted to sell anything? In most shops there would be an additional hurdle to get over before this plan could be attempted. The shop stewards and the union would object strongly to shifting men out of their classification.

A commendable motive might exist if it is their intention to show the men that the company must meet and beat competition. Perhaps they hope to impress upon the shopman that his wages come out of the selling price of the article or product and not out of some vast fund contained in the company treasury. The objective of such an educational maneuver is increased production, interest, and enthusiasm in the work. This is a worthwhile objective but the method is very expensive and impractical. As a general thing the man in the shop is there to earn a living and will turn out enough work to keep his job. There will be some who will produce more than this basic minimum in proportion

(Continued on page 248)

*"Could you direct me back to the plant cafeteria? I made a wrong turn someplace."*



# on-the-job performance tests prove IT PAYS to specify MACKLIN MM segments

A complete line of Macklin Segments provide fast cutting action without burring or checking. Fit any standard chuck.

Macklin MM Segments give better cutting action on hard-to-grind steels and carbides.

*Here's Proof . . .*

Macklin MM Segments increased production per segment wheel 127% in a large machinery manufacturing plant which surface grinds steel and cast iron machinery parts. Look at these figures . . .

| | Macklin | Competitive Wheel B |
|---|---|---|
| Number of pieces ground per segment wheel | 392 | 173 |
| Segment life | 13 days | 6½ days |
| Dressings required | 112 (in 13 days) | 65 (in 6½ days) |

*Here are other typical MM Segment Performance test summaries:*

| Product | Performance Record |
|---|---|
| Cast iron table tops | Macklin MM Segments, 1000 pcs. Comp. Wheel B, 400 pcs. |
| Miscellaneous metal parts | Macklin MM life 2½ times greater than Brand C. |
| SAE 1335 heat-treated steel | Macklin MM removed as much metal in 15 hours as Brand B removed in 35 hours. |

*Here's why you get these results . . .*

It's the unique MM construction consisting of a fine abrasive in pellet form which is engineered into MM Segments. This construction provides a constant flow of fine abrasive particles between the wheel and the work. The result? More metal removed per segment . . . fewer dressings required . . . and finer surface finishes.

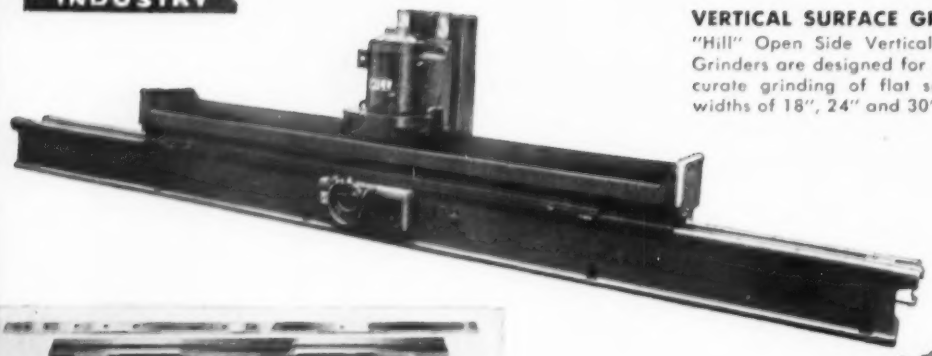
***But, don't take our word for it. Call your nearest Macklin distributor and arrange for a test on your own work. You'll be glad you did.***

MACKLIN company

JACKSON, MICHIGAN

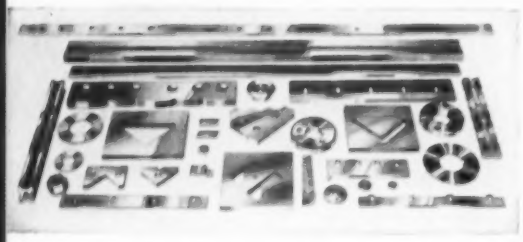
# HILL ACME

HILL ACME TOOLS FOR INDUSTRY



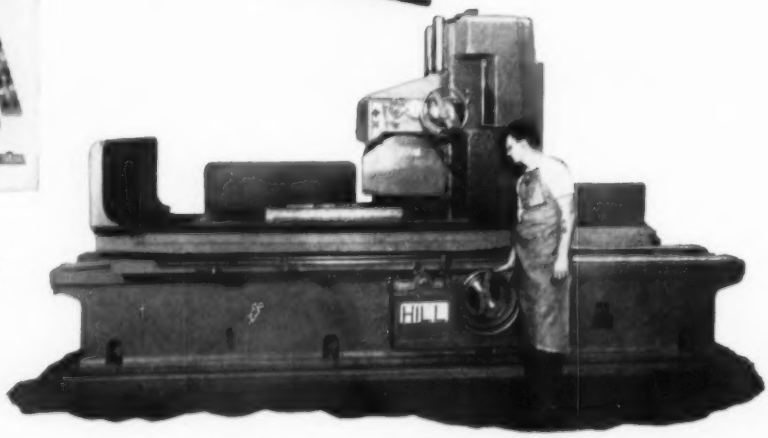
**VERTICAL SURFACE GRINDERS**

"Hill" Open Side Vertical Spindle Hydraulic Surface Grinders are designed for rapid stock removal and accurate grinding of flat surfaces. Furnished in table widths of 18", 24" and 30"; table lengths 60" to 240".



**SHEAR KNIVES**

"CLEVELAND" Knives and Shear Blades. Solid and laid steel shear blades; rotary slitting and side trimming knives; metal cutting machine knives.



**HORIZONTAL SURFACE GRINDERS**

"Hill" Open Side Horizontal Spindle Hydraulic Surface Grinders for accurate grinding of flats, angles, irregular and special shaped surfaces. Furnished in table widths from 18" up to 36"; table lengths 60" to 240".

**ABRASIVE BELT GRINDING & POLISHING MACHINE**
**(Pinch Roll Type)**

For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.

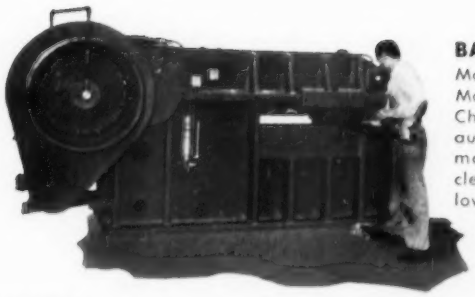
The basic HILL two-roll vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.

**ABRASIVE BELT POLISHING MACHINE**
**(Hydraulic Table Type)**

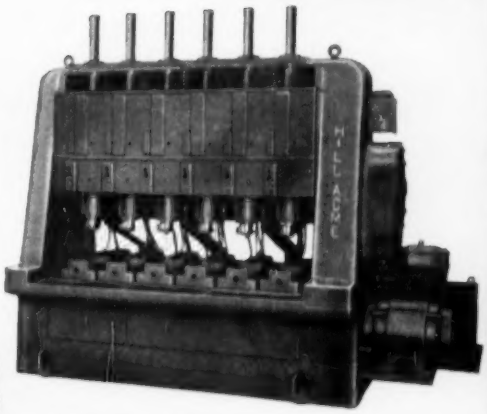
For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with fully hydraulic reciprocating table.

# Tools for Industry

HILL ACME TOOLS FOR INDUSTRY

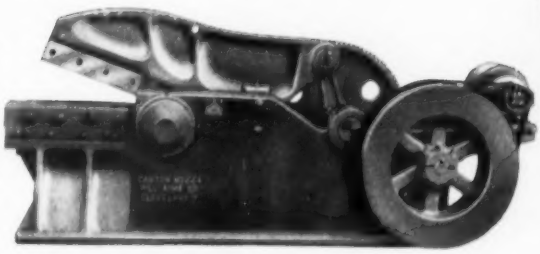


**BAR-BILLET SHEARS**
Modern, efficient design. Made in 3" to 6½" sizes. Choice of hand, semi-automatic or fully automatic feed. Assures clean, square cuts with low maintenance.

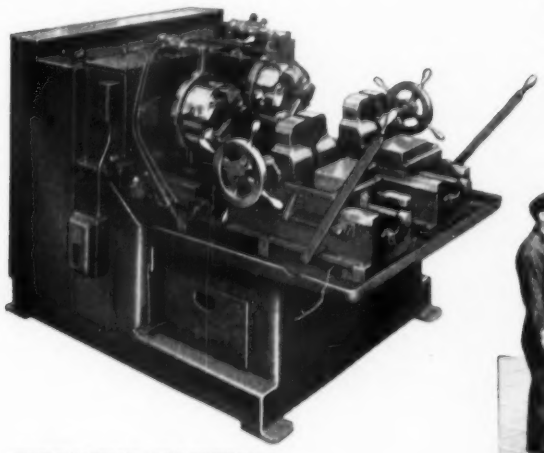


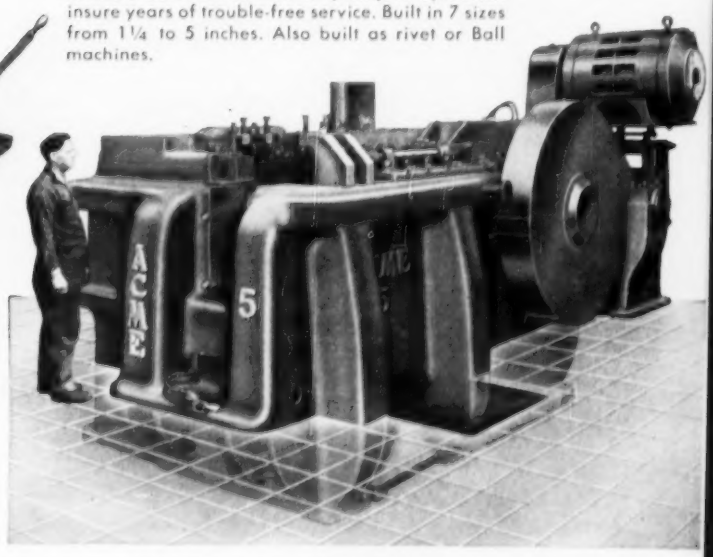
**TAPPING MACHINES**
"ACME" model XC-W six spindle Coupling Tapper. Built in 1" capacity and larger, in 6 or 8 spindle. Can be adapted as a nut tapper.

**ALLIGATOR SHEARS**
"CANTON" Alligator Shears are the most rugged, powerful and trouble free shears ever built for processing scrap. Modern design has produced a stronger shear, with fewer parts, and positive lubrication. Made in a full range of sizes to meet every condition.



**FORGING MACHINES**
"ACME" XN Forging Machines produce accurate, quality forgings for long uninterrupted periods. Massive construction and simplicity of operation insure years of trouble-free service. Built in 7 sizes from 1¼ to 5 inches. Also built as rivet or Ball machines.






**THREADING MACHINES**
"ACME" XLA Single and Double Spindle Threading Machines are equipped with patented tangent or hob type die head which assures economical, accurate, high speed production. Furnished in sizes from 1" to 3½" capacity.

## THE HILL ACME COMPANY

**1201 WEST 65th STREET • • • CLEVELAND 2, OHIO**

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

# MILFORD RIVETERS—

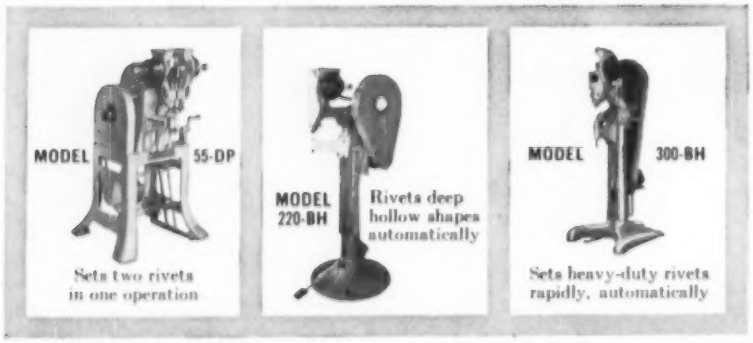
## for faster assembly, for dependable fastening

*Fasten a wide range of assemblies Safely—Rapidly—Automatically with Milford Rivets and Riveters*

Delicate wrist watch bracelets . . . rugged, heavy-duty truck brake lining—a wide range of parts like these are being fastened safely and economically with Milford Rivets and Rivet-Setting Machines.

Call on Milford's versatility and skill to adapt a basic rivet-setting machine to your particular requirements—call on Milford to solve your fastening problems and come up with substantial savings.

To cut production costs, improve product appearance, fasten assemblies automatically—get in touch with Milford!




THE MILFORD RIVET

**MILFORD RIVET & MACHINE CO.**

MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA
ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.


to their enthusiasm and desire to get ahead.

People do what they do because of their desire to attain a certain objective. Management should acquaint themselves with this basic truth and plan their actions in accordance with it. If they would realize increased output they must increase the desire of the employees to produce by paying higher wages or by adopting an incentive system. In most companies there are some people who could profit by selling the company's product. These include the product designers and members of the management team. The consumer's reaction to their product, their praise, and their criticism would be valuable to them in their work. Most companies depend on their sales force to relay this information to the design departments. It is better and much more effective if the employees who make decisions based on this information receive at least part of it first-hand. If anybody other than salesmen are sent out selling it should be the designers and executives, and not the shopmen.

Sing Yen
*Brooklyn, NY*

### SALESMAN FOR A DAY

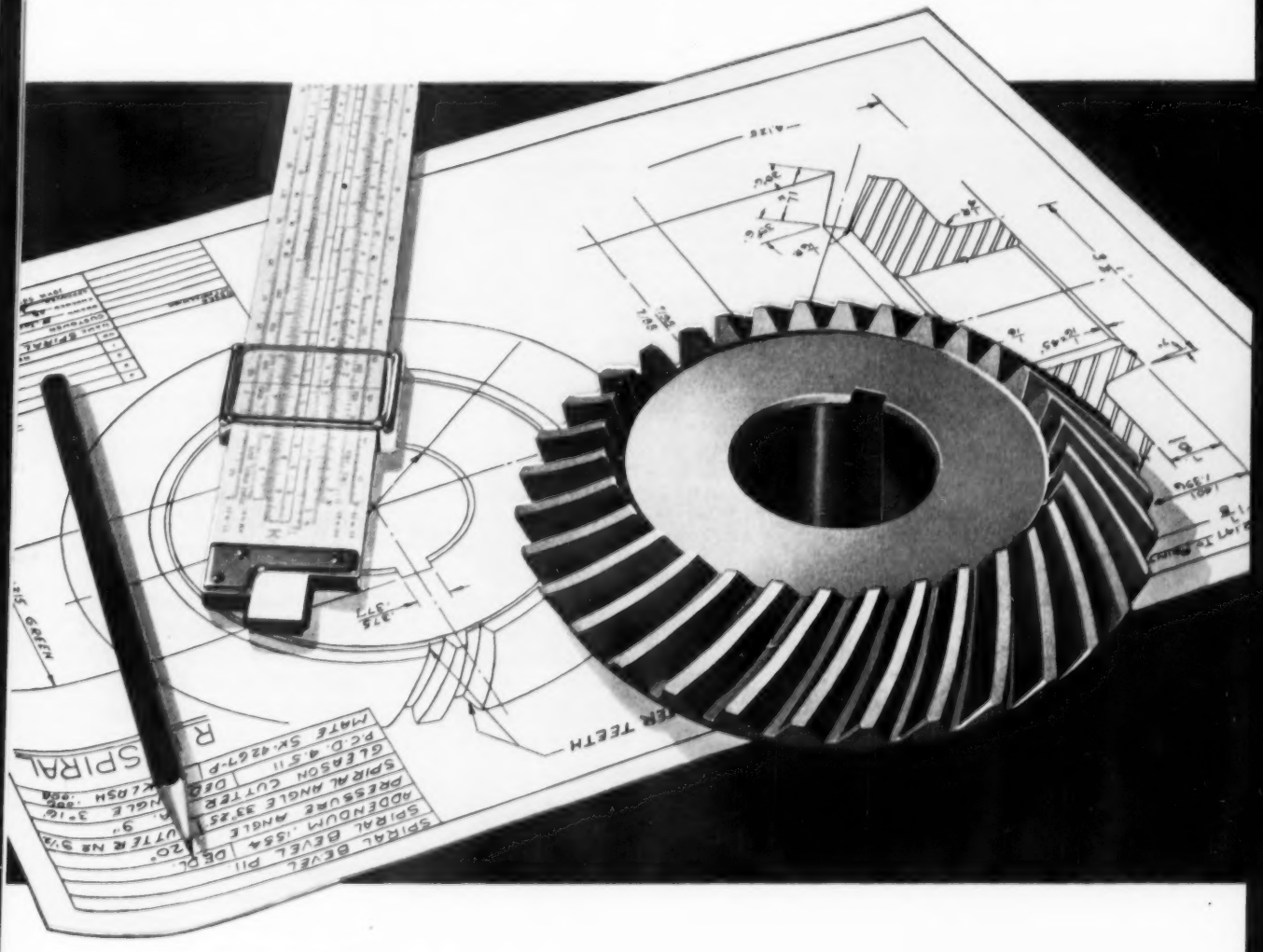
IT IS THE responsibility of management to develop a mature and healthy employee attitude. Management must set up a balance between staff and line. Employees should be trained to appreciate and understand the other workers in the organization.

The salesman meets the customer, gets the price, and has the satisfaction of delivering and seeing the product we make, work. Each employee has his own particular talent or ability, and all are welded into one organization. That makes each

*"Seems I'm the only one hasn't had a collection for something or other. . . . Just saw some dandy fishing tackle. . . ."*

# "ENGINEERED QUOTATIONS"

When our engineers study our customers' prints, they look for ways to improve gear performance, ways to simplify gear installations, ways to cut gear costs. When they find a way that they consider better they report it to the customer for his consideration. Very often these "engineered quotations" are accepted. Such careful scrutiny of every engineering and manufacturing step by *gear specialists* is one reason why so many manufacturers use Automotive Gear Works as their "gear department". May we submit an "engineered quotation" on your gear requirements?



DOUBLE DIAMOND GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

# Automotive Gear Works, inc.

ESTABLISHED IN 1914 — RICHMOND, INDIANA

SUBSIDIARY OF EATON MANUFACTURING COMPANY

**PERFORMANCE**
***Makes Gears***
**EASIER TO SELL**

*REPRESENTATIVE, THE CINCINNATI GEAR CO.*

Often when calling on a new customer after his first gear order has been assembled and is in test operation, he will tell me something like "finest gears we ever used — certainly improved operating qualities of our product — no trouble in assembly, no vibration, they are as quiet as a precision watch". This customer is just learning what Cincinnati Gear's older customers already know, and what I've known for the thirteen years I've represented Cincinnati Gear in the Cleveland area: that we make *ONLY GOOD GEARS* — gears that give 100% performance at all times. If, by chance, there is an error, there is never a compromise; the gear is promptly replaced.

This pleases our customers, of course, but it also pleases me — and gives me the confidence in our firm and our product that I need to do a first-rate selling job. This confidence, I feel, is about the most valuable "sales aid" I have. I can solicit an order and know full well that the gears shipped will deliver performance desired — and result in the kind of customer satisfaction that leads to repeat orders. I can't think of anything that makes my job easier.

**THE CINCINNATI GEAR CO.**
CINCINNATI 27, OHIO
*"Gears—Good Gears Only"*

CINTI

employee important in the final sale. One of the first things a new salesman learns is what the product is made of, and how it is made. Someone is going to ask him these questions and he must know the answers.

It is true that many shopmen have a narrow view of what goes on outside their own department. They know very little about sales, advertising, management problems, or the part played by other departments. They have never been trained to see the whole objective.

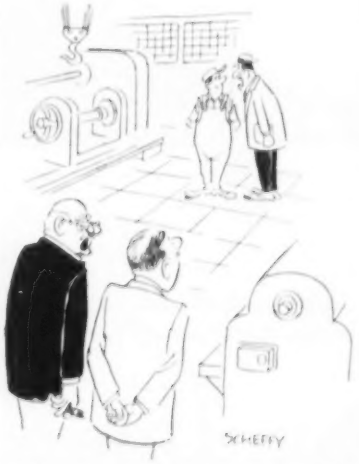
All industry is aware of the fact that good workmanship depends on high morale and a good attitude on the part of employees. When we look around the shop today it does not seem as if the average employee wants to get ahead. Fortunately there are many who do, and are constantly trying to learn more.

I can see no harm in sending a shopman out with the salesman for a day. A broader knowledge of the company's operations will help the employee and the company. Industry is constantly working to make the employees' association with the company something else besides a job and pay envelope. The salesman and the machinist have problems that are as different as night and day. It would do a world of good if it were possible for each to know the other's problems.

A E Salmons
*Norristown, Penna*

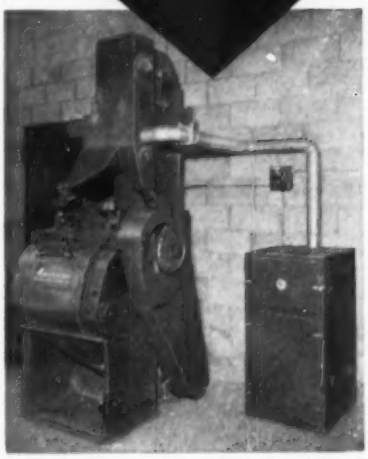
## SALESMAN FOR A DAY

A new way to waste time and company money is certainly the right answer to this plan of sending out machinists with salesmen. In the first place, a person must have a




*"He'd make a better foreman if he wasn't a Soprano."*

**how to trap dust**
*that damages your machines and hurts company morale*



*Priced from $190.00*

***easy-to-move***
**TORIT DUST COLLECTORS**
***trap dust at its source!***

Untrapped dust costs you money, "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-the-building) system. Torit unit operates only when machine or combination of machines it protects are in use. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to...

**TORIT MANUFACTURING COMPANY**

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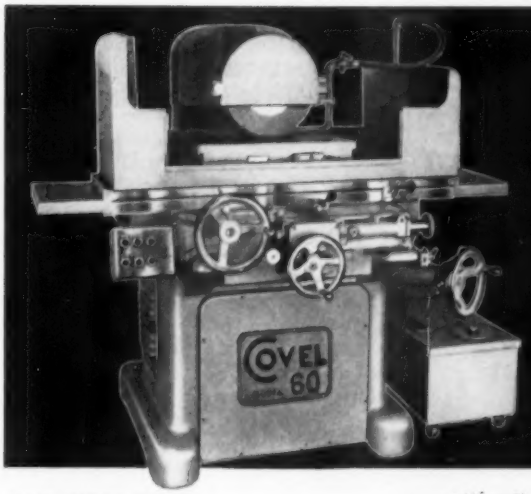
311 Walnut Street
St. Paul 2, Minn.

Sweet's



# Compare THESE FEATURES...

## COVEL HYDRAULIC SURFACE GRINDERS

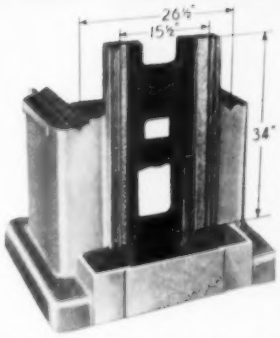
**Available in three sizes**

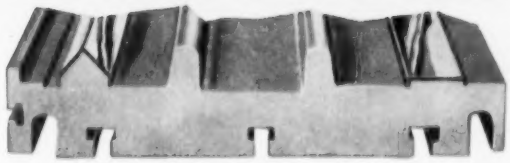
| | No. 20 | No. 35 | No. 60 |
|---|---|---|---|
| Work capacity | 6"x18"x12" | 8"x24"x11" | 14"x24"x15" |
| Grinding wheel | 10"x¾"x3" | 12"x¾"x3" | 14"x1"x3" |
| Spindle motor, HP | 1½ | 2 | 3 |

### ONE-PIECE BASE

Vertical and cross ways are integral for permanent alignment.

Length of vertical ways.....34"
Width of vertical ways.....15½"
Distance between double V cross ways.....26½"
Weight of base, 1570 lbs.



### HARD CHROME TABLE WAYS

Special Covel plating process applies hard chrome surface direct to the close grain, alloy cast iron surface of V and flat table ways *after* they are precision hand scraped from a master plate. Tables in service for over five years show but slight wear, no flaking. Available at extra cost.

### HARDENED AND GROUND LEAD SCREWS

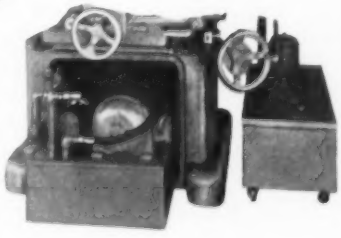
Made of best quality tool steel, Covel cross feed and elevating screws are hardened and ground to insure long-lived precision operation.

### ELEVATING HAND WHEEL

Located *below* the level of the table where the operator can read the graduations easily and keep an eye on the work.

### CLOSED HYDRAULIC SYSTEM

Prevents dirt or coolant from contaminating the hydraulic oil. Covel low pressure system throughout. 15 gallon oil reservoir located in base of machine slides out for easy maintenance.



### THREE SPINDLE SPEEDS

This Covel cost reducer makes it easy to obtain proper peripheral speed for the grinding wheel even after wheel has been worn down. Permits use of worn wheels without loss of grinding efficiency. Cartridge-type sealed-for-life anti-friction spindle, V-belt driven.

***These features, plus many others, are reasons why Covel is rated "tops" in surface grinders. Write or 'phone for full information.***

**COVEL PRECISION GRINDERS**
**HYDRAULIC & HAND FEED SURFACE GRINDERS**
**UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS**

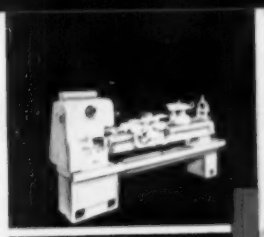
**DEPT. AM-176**
**BENTON HARBOR, MICHIGAN**
**WAlnut 6-6157**

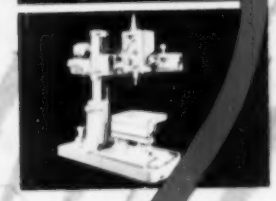
flair for selling. Very seldom is it possible to take a person who dislikes personal contacts and make of him a good top-notch salesman. This, you might say, is not the question at point, but to understand just what the machinist or worker is seeing and experiencing he must first of all know what salesmanship is. To judge another's work one must know it backwards and forwards, not just a hearsay acquaintance with it. How can you judge a good opera if you are not musically inclined, and if you do not know something of music and voice? The same is true about selling.

Just what is going to be accomplished by sending out an untrained person along with a company salesman? Probably the only point in common is the fact that they both work for the same company. Sure . . they will get along . . it means a paycheck to both of them.

It would appear that Al feels that his workers have little interest in their work. He is probably right. Today, unless the worker is actually a partner in the business through direct financial contact in a share-the-profit plan, he cares little about what happens other than that he is secure on his job. He is getting good money, and probably is making more than the salesman anyway.

The one thing which we must always remember when thinking about reactions is that one case does not mean the average condition. Often we can single out one case, or build up one idea, only to find that the majority does not feel that way. Or that when a group is surveyed there are mixed feelings ranging from a cold "no" to a hot "yes." So it is with shop personnel; some of them believe whatever is told them; others believe nothing—in fact won't believe under any condition, even when





AGRICULTURAL equipment makers know the hazards of outmoded equipment and are actively replacing many of their 19,000 drilling machines and 13,000 lathes.* Over *half* these machines are more than 10 years old and this is the average for *all* the nation's machine tools. Yet modernization is quick and inexpensive with "Standard Machine Tools" developed against fresh, new concepts of appearance, function and accuracy. To this end, Cincinnati Lathes and Drills are built to do much of your jobbing, tooling, maintenance and light production work at tremendous savings. Write for complete catalog information. Cincinnati Lathe and Tool Co., 3247 Disney, Cincinnati 9, Ohio.

*Figures from American Machinist's Seventh Inventory

*center on...* **cincinnati lathes and drills**

Machines shown are Cincinnati's new 37½" Hardclad Radial Drill and 15" Troy-Top Lathe.

# MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN

HONEYWELL

# CUT COSTS!

## Make your plant more automatic and more productive

*Send for Catalog #83 for information on MICRO SWITCH "Industrial Enclosed Switches"*

• For years plant operating men have been putting new life into old machines—at low cost—by installing MICRO SWITCH precision switches to make them more automatic and more productive.

They do so by using MICRO SWITCH switches as limits, interlocks and safeties on almost every conceivable type of plant equipment. Special switches are available for use in explosive atmospheres or other hazardous locations. A wide variety of circuit arrangements, actuators and enclosures meets specific operating requirements.

Plant superintendents, electricians and maintenance men have found MICRO SWITCH products invaluable in making present equipment more productive. Full stocks of switches are readily available from authorized distributors who are as close as your telephone. Look under "Switches, Electric" in the Yellow Pages.

**ANY OF THESE CATALOGS WILL BE SENT ON REQUEST**

| | |
|---|---|
| **62a** • "Basic Switches" | **82** • "Basic and Enclosed Switches" |
| **73b** • "Toggle Switches" | **83a** • "Industrial Enclosed Switches" |
| **74b** • "V3 Switches" | **90a** • "Mercury Switches" |
| **75a** • "Subminiature Switches" | **101b** • "Switches for Industry" |

## MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

### HOW SWITCHES HAVE BEEN USED TO SAVE TIME AND MATERIALS

**Stops needle breakage:**
Switch stops knitting machine when slack develops in wire. Mechanism starts automatically when slack is relieved.

**Protects personnel:**
Explosion-proof switch installed on filter system permits operation of equipment only if vent valve is closed.

**Prevents conveyor pile-up:**
Two switches wired in series, each operating independently as sugar bag passes. When bags pile up, both switches are operated and conveyor stops.

**Counts revolutions of mixer:**
Switch connected with counting device is actuated by each complete revolution of mixing drum, recording number of revolutions at convenient point for operator.

- 9" column; 3' or 4' arm
- spindle speed ratio of 40-to-1
- 12 speeds (up to 3700 rpm) through direct-reading dial
- automatic tapping reverse
- adjustable spring counterbalance (feel remains the same from lightest to heaviest tools)
- hardened tang slot
- safety elevating nut and screw (arm can't drop or overrun)
- hardened arm ways for head
- rigid accurate spindle mounted on 5 precision ball bearings

You can acquire this radial for only $ 28 an hour, if you operate two 40-hour shifts, by using Gilbert's new financing plan: 6% simple interest (3% add-on), up to 5 years to pay (subject to change)

*those who buy*

**GILBERT**

*buy Gilbert again*

# newest *high-speed* radial

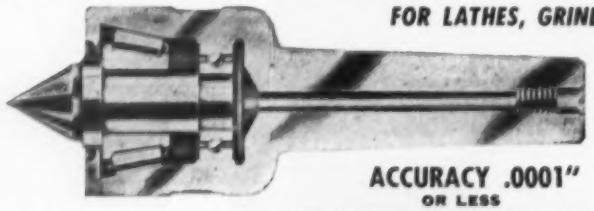
Your many demands for a high-speed light-duty radial are met—completely and economically—by this new Gilbert 3 hp machine. Compare the features at the right with other radials of equal capacity, and you see why the Gilbert is the best buy in its class. Traditional Gilbert accuracy, fast response, and wide-angle work visibility make your shop more productive, more versatile. Variety of bases, runway mounting, or tables available. Get all the details in Bulletin 255.

*The Cincinnati Gilbert Machine Tool Co.*
*3344 Beekman Street, Cincinnati 23, Ohio*

# NOW BETTER GROUND FINISHES!

***with J & S guaranteed* self-adjusting live centers***

***FOR LATHES, GRINDERS***



**ACCURACY .0001"**
**OR LESS**
**with PERFECTION FREE CENTERS**
**SPINDLE TYPE**

*GUARANTEED FOR 2000 HOURS OR ONE YEAR

***tapered Timken bearings and design accept heavier loads with guaranteed accuracy.***

**SIMPLE DESIGN:**

Only six parts, the main body is one piece which serves as the cup for the roller bearing on which spindle turns. This permits a much greater capacity bearing in the same size body.

**AUTOMATICALLY ADJUSTS FOR WEAR:**

*Notice* the clearance behind ball bearing which allows the whole bearing assembly to move back, automatically compensating for wear on roller bearing. This maintains center's point to original concentricity.

**ABSOLUTE CONCENTRICITY AND ALIGNMENT FOR BEARINGS:**

Both conical and cylindrical bores of body are ground at same setting in work head. Point is ground under load in its own bearings to insure running dead true.

Design plus self-adjusting features provide accurate and chatterless grinding.

| TAPERS AVAILABLE | | | | |
|---|---|---|---|---|
| MORSE | JARNO | B & S | NORTON | LANDIS |
| 2 to 7 | 6 to 20 | 7 to 18 | 10 to 24 | .8125<br>1.3350<br>1.7500 |
| SPECIAL POINTS, HEADS, SHANKS AND TAPERS MADE TO ORDER | | | | |

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**CLAMPCUT**

**J & S TOOL CO., INC.**
870 DORSA AVE.
LIVINGSTON, NEW JERSEY


they actually see for themselves. Why? You answer it. We say "human nature."

An idea which would help acquaint workers with the product, its sales problems, and company profits is a wonderful one. It cannot be accomplished by any easy method such as sending out machinists with salesmen. This sounds like a company with top officials who have money to waste and do not want to be bothered about planning a sound program. It would appear that Al's company, without concentrated thought of the higher officials, dreamed up a way to make a pass at education of the worker by spending some money foolishly.

Programs have been developed for companies which have been successful in interesting the workers in their company's products. No fixed formula (as far as this writer knows, and he has helped in establishing such programs) has ever been developed to be used as a blanket setup in all companies. Each presents its own problems and must be solved within the company. Every top official must be for the program and whole-heartedly for it. Each must sell his workers in the supervision class before anything can be done. Foremen must first be properly trained. They must know the company products, not just their own small part in each product. Before the workers can become properly appraised of what the company is doing and how hard it is to sell the product, the foremen and all the other groups of management must know why it is hard and who does what.

No, this is not accomplished in all

*"What do you mean calling me a loafer? Who started the bowling league? Who organized the baseball pool?"*

companies today. In fact, very few organizations today know what the other fellow does on the management team. Often little interest is shown by supervisors and no interest is expressed to learn. So before a company pays out money to send machinists along with a salesman, it would be better to train the foremen properly so that Ed and Al both agree that the ideas which the company is putting into effect are the right ones and will pay dividends.

It is not the case of a shoemaker sticking to his last, but a case of building a foundation on solid ground and then building the multistory building above this strong foundation. A good foundation can support a fast-growing and highly coordinated company. Harmony and true understanding can be obtained only by having a solid foundation of understanding and teamwork among management from the foreman to the chairman of the board.

Charles D Townsend
*West Hartford, Conn*

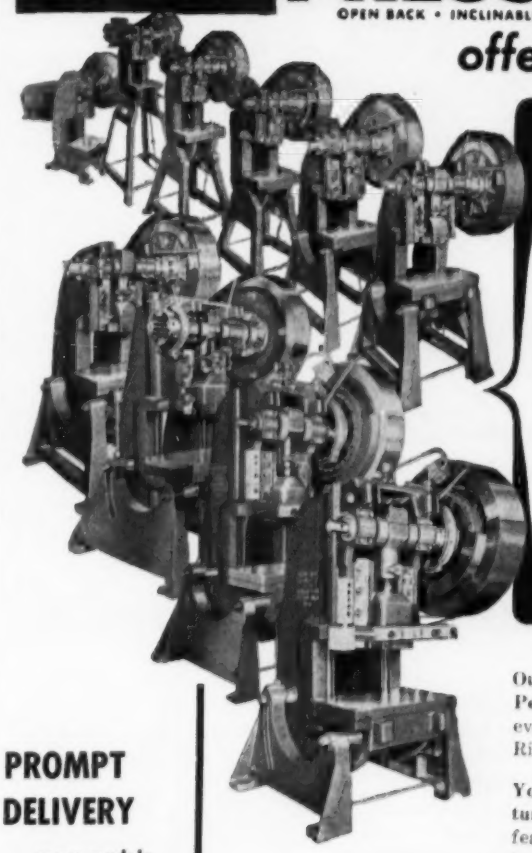
## SALESMEN FOR A DAY

SIMPLY TO GRATIFY the desire of every machinist who might fancy a day out with the salesman could be a mockery of management and a needless expense, to boot. After all, it's the shareholders' money we're spending.

I am all for giving everyone his head; such an attitude is often prolific of surprise, but careful consideration must be given to the subject. We are all familiar with the type who fancies himself in any role, from salesman to senator, even president. That is a form of vanity, but something more is required. I don't think the cobbler should stick to his last if he gives promise of more important things to come. If machinist volunteers for a knowledge of the sales side were numerous—I don't anticipate they would be—they should be critically viewed for quality, and those who seemed likely to benefit from such wider experience should be given their chance.

If young, intelligent machinists of good presence, fluent, sensible talkers, happened to be on the payroll, it would be a capital idea to give them a run round with the salesmen, with a view to expanding or making good any wastage in the sales force. From experience, too many fluent talkers with no practical experience of the manufacture of the commodity on offer are engaged in selling staffs today. Nonetheless, if every cobbler had stuck to


NOW PRESS-RITE
OPEN BACK • INCLINABLE *Power Presses*
offers you...



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POWER PRESSES
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AUTOMATIC or MANUAL FEED
•
2 to 85 TON CAPACITIES

**Outstanding Profit-Making Performance** is built into every heavy duty Press-Rite.

**You will find more features** . . . yes, important features that help you turn out accurate stampings and meet those tough production schedules.

**Dies Last Longer** . . . Press-Rite's special alloy, high-strength frame and tie-rod design gives rigidity that really pays off in reducing costly die wear. You get longer runs between die grinds and keep dies at peak efficiency.

**Airflex Air Clutch and Rotor-Seal Timer** assures maximum power and greatest production. The High Speed Clutch Control provides SIX operating positions. The Press-Rite Airflex Clutch also protects dies against accidental breakage as air-pressure is adjusted for-the-job and allows the clutch to slip on "double headers".

**Automatic Feeds, Variable Speed Drive** . . . We'll "factory equip" your PressRite with the latest controls, and mount automatic feeds for high speed operation.

PROMPT DELIVERY
. . . some models shipped immediately

PRESS-RITE ENGINEERING SERVICE
Send us drawing or sample. Our engineers will gladly help you select the right press. All recommendations are based on years of actual press experience. No obligation of course.

10 Capacities:
2 TON
5 TON
10 TON
15 TON
20 TON
30 TON
37 TON
45 TON
60 TON
85 TON

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SALES SERVICE MACHINE TOOL CO.
2347 University Ave. St. Paul 14, Minn.

*Used by more . . . for more production*
PRESS-RITE
OPEN BACK—INCLINABLE *Power Presses*

Chain Belt Co. Installation. Tool index boards, left, quickly locate all tools. Employee record boards show all tools charged to each employee.

CHAIN BELT COMPANY OF MILWAUKEE REPORTS

# "We couldn't get along without our McCaskey Tool Crib Control"

Twenty years of service for Chain Belt Company of Milwaukee has proved McCaskey Tool Crib Control is an indispensable part of any tool crib operation. Experience has shown that the small initial investment is often returned many times within the first year of use, and that annual savings can amount to thousands of dollars.

McCaskey tool accountability cabinets in Chain Belt Company tool crib.

Here are just a few ways McCaskey Tool Crib Control has saved money for Chain Belt Company and will save money for you:

(1) Keeps tool inventory in the crib at a minimum, reducing monthly purchases.

(2) Prevents accumulation of idle tools at machines or benches.

(3) Reduces tool breakage by identifying source of breakage.

(4) Reduces loss and misplacement.

(5) Eliminates slow crib service, reduces non-productive time of employees and machines.

And, the McCaskey System does all this and more without additional crib personnel. McCaskey Systems are completely flexible—there is a set-up for your plant regardless of size or products. Find out how you can cut your tool expense . . . mail the coupon today.

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Production • Inventory • Tools • Maintenance • Costs

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*Manufacturers of Business Machines Cash Registers, Business and Industrial Systems, Electronic Equipment, Electri-Cars.*

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Address_____


his last, the world and industry would be the poorer today.

Some twenty years ago, a salesman succeeded in introducing carbides into a world-famous forge in the Glasglow area. It was a conservative outfit but one young charge-hand machinist showed keen interest in the (to him) new cutting medium. In a remarkably short time his enthusiasm and production figures transformed the extensive machine shops; carbides had become a must. Later, he went on the road for an English concern and so impressed that company with his ability to sell carbides that they eventually moved him over to Canada to manage their manufacturing and selling side there.

I ran across him in London some four years ago. He had come over to a machine tool exhibition at Olympia, leaving his assistant managing director to hold the fort in Canada during his absence. His unqualified success with carbides was due to his practical knowledge of machining, the application of carbides, and also to his enthusiasm and interest. His technical qualifications were not on a par with his practical experience, but boundless enthusiasm, live-wire perfectionism in all he put his hand to, and an excellent practical background, discounted that and put him right at the top. He wasn't content to stick to his last, so he went places.

All machinists or setup men are not of that caliber, however, but they are more numerous than is commonly supposed and the tragedy of modern pushbutton industry is that so many of them are never recognized or, if recognized, are never

*"Yep, we're working on something top secret all right! We're trying to figure out how to make the boss think we're working while we're out for a coffee break!"*

*"Could I borrow some of your paint remover?"*

given a chance to show their paces.

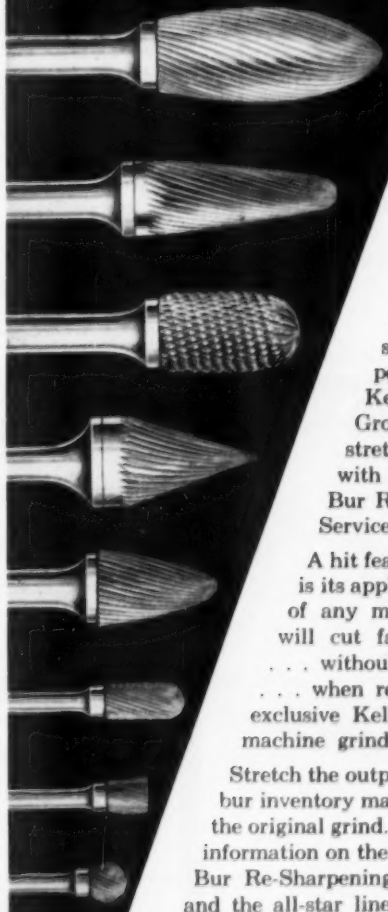
The salesman for a day is, as Al remarks, a hot idea, scorching hot, in fact, provided it is not thrown away on unsuitable, unresponsive subjects. A day out with the selling man is unlikely to show the money-conscious machinist how to increase his earnings as a machinist, the sole concern of most operators. They are not concerned with broadening their minds in the hope that, one day, they will reap a rich reward. They are concerned with the immediate present. They live for the day, and there are so many of them.

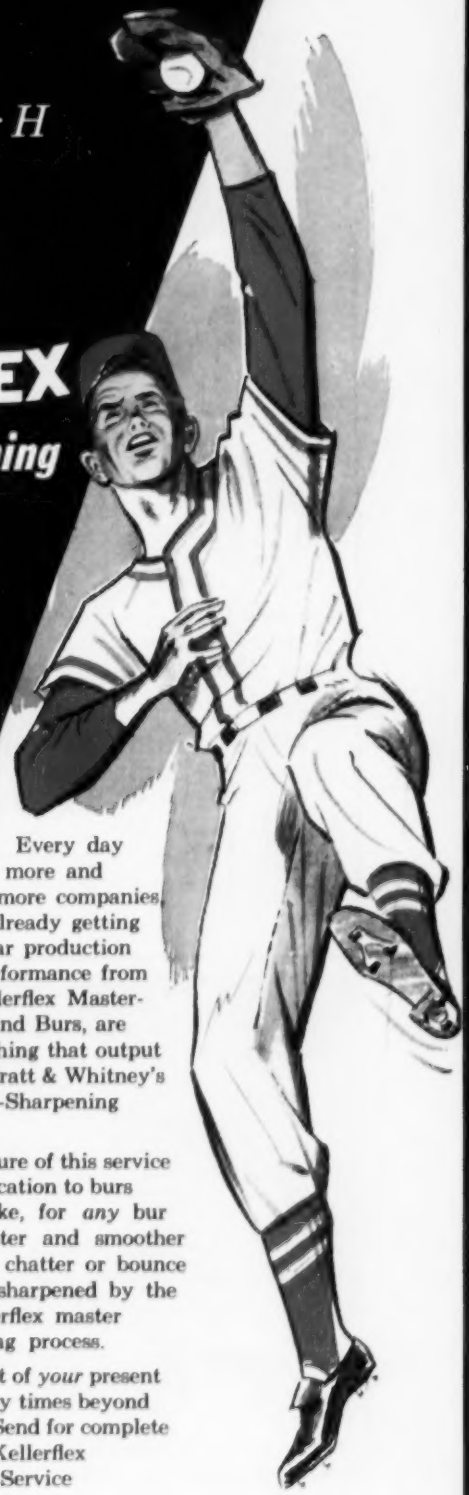
Nothing but good can come from making all employees familiar with all the varying aspects of the activities of the company that employs them. Not all will benefit, not all will wish to, but the inquiring minds will be enriched by the new experience and such pupils and the company will benefit accordingly. Finish, accuracy, durability, performance, pleasing design, etc, are sure to find a place in a sales talk. The alert, imaginative, enthusiastic machinist will carry away from such talks much that is new and of value to him.

Such an experience may suggest to him ways and means of improving on past shop performance, but this can be only if the machinist is mentally alert and receptive. For those who do not measure up in the matter of quality, little can be expected in the way of improved shop performance. As a consequence of a few sales visits, the less promising of the visiting machinists may benefit from being taken notice of, and may take a little more pride than hiterto in their work, so that, indirectly, some little improvement may emerge. It is almost certain

*Puts the S·T·R·E·T·C·H in a Star Performer*

**KELLERFLEX**
***Bur Re-Sharpening Service***





Every day more and more companies already getting star production performance from Kellerflex Master-Ground Burs, are stretching that output with Pratt & Whitney's Bur Re-Sharpening Service.

A hit feature of this service is its application to burs of any make, for *any* bur will cut faster and smoother . . . without chatter or bounce . . . when re-sharpened by the exclusive Kellerflex master machine grinding process.

Stretch the output of *your* present bur inventory many times beyond the original grind. Send for complete information on the Kellerflex Bur Re-Sharpening Service and the all-star line-up of Kellerflex Burs.

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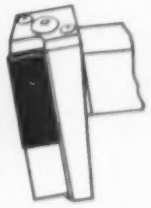
*Direct Factory Representatives in Principal Cities*

MACHINE TOOLS • GAGES • CUTTING TOOLS

# V-R TOOLHOLDERS CUT

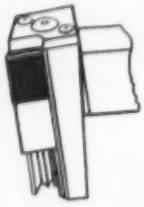
## *Savings Range from 10% to 200%!*

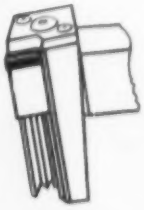
### V-R Longhead Toolholders Eliminate Carbide Waste



V-R longhead elevator type toolholders will handle any standard cemented carbide inserts up to 1½" in length.

This insert has been reground as many times as possible for use in ordinary toolholders.





In a V-R toolholder, the insert can be reground until it is no longer thick enough to take the cut required.

**V-R toolholders** cost less to use because of unique design features not found in any others:

**Less Downtime** because you do not have to reposition the toolholder when you replace or index inserts. Change of inserts is fast and easy — there are no loose pieces to fall out.

**Lower Carbide Cost.** You can consume up to 90% of a long insert, nearly twice as much as with other toolholders.

**No Grinding** when you use V-R toolholders and throw-away inserts.

**Long-Life Chipbreakers.** V-R chipbreaker plates are made of a special cast alloy (not steel), chosen for its exceptional wear and shock resistance characteristics.

***NEW CATALOG FREE ON REQUEST***

**. . . new Catalog No. VR-437 gives complete data on the design and construction of all V-R toolholders . . . contains dimensional drawings, parts lists and prices. Also describes V-R carbide inserts in grades to meet your needs. Get your copy now. Call your V-R Representative or Distributor, or write to Vascoloy-Ramet Corporation, Waukegan, Illinois.**

## *Styles to handle 90% of Your Machining Operations*

**Standard Brazed Tool** — **Comparable Toolholder**

AR-AL

TAPR-TAPL

**Straight Turning**

**Standard Brazed Tool** — **Comparable Toolholder**

D

TETR-TETL

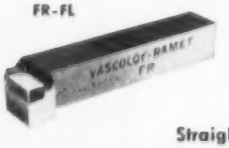
**45° Lead Angle Turning**

BR-BL

TBPR-TBPL

**15° Lead Angle Turning**

FR-FL



TFPR-TFPL

**Straight Facing**

E

TDTR-TDTL

**30° Lead Angle Turning**

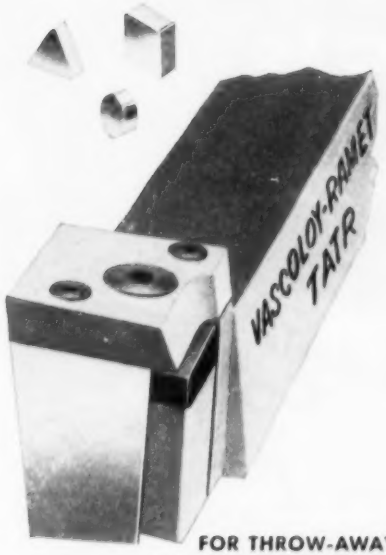
FBR

5FPR-5FPL

**15° Lead Angle Facing**

# CARBIDE TOOLING COSTS!

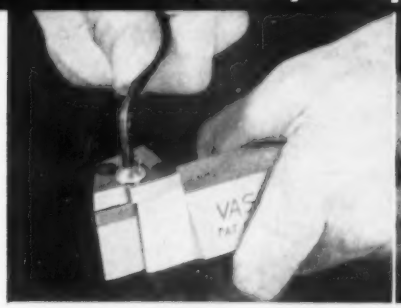
**FOR INSERTS UP TO 1½" LENGTH**
(Negative Rake)




**FOR THROW-AWAY INSERTS**
(Negative and 6° Positive Rake Styles)

Right and left hand styles for: straight turning; straight facing; 15°, 30° and 45° lead angle and plunge turning, and chamfering.

## *Fastest, Simplest-to-use Toolholder There Is!*



**Insert is clamped between adjustable elevator and fixed position chip-breaker plate. That's all there is to it!**

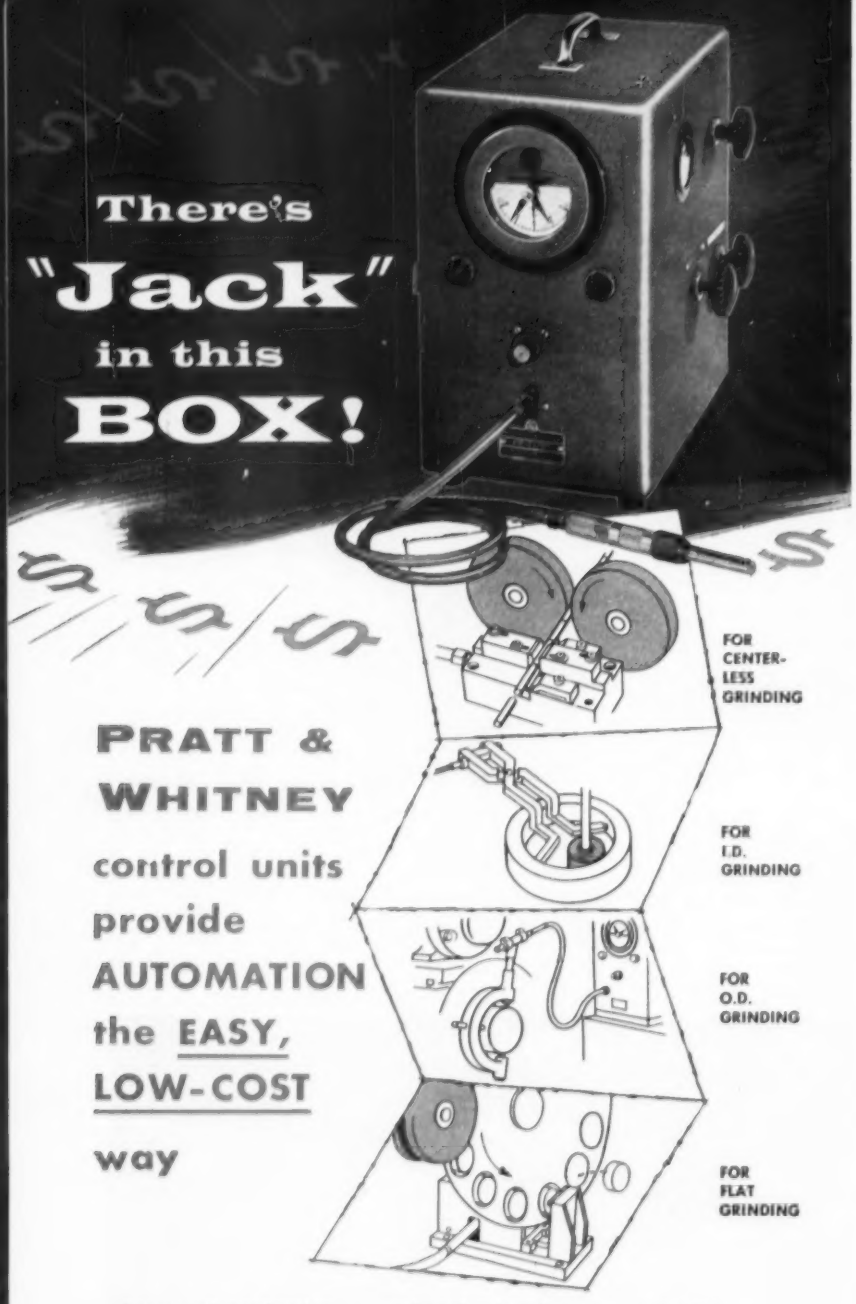
**Insert is removed and replaced in seconds. It is automatically indexed just by slipping it in place!**

**Works easily in any position, thanks to fixed position chipbreaker plate and socket in each end of main screw.**

*MANUFACTURERS OF:*
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

**Vascoloy-Ramet Corporation**
SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION
**802 Market Street • Waukegan, Illinois**

TH-587




**PRATT & WHITNEY** control units provide **AUTOMATION** the **EASY, LOW-COST** way

Increased production . . . reduced reject losses . . . greater accuracy! These are the profitable advantages you get through Automatic In-Process Gaging. And now, *standard, on-the-shelf* Pratt & Whitney Control Units . . . plus a minimum of special gaging fixtures . . . can give you an in-process gaging installation exactly tailored to *your* needs *without* the long delays and heavy expenses involved in engineering and constructing special equipment.

**GET FACTS AND FIGURES** . . . Prove how P&W Automatic, In-Process Gaging can improve your profit picture . . . how easily it can be applied to your machines. Phone the P&W Branch Office near you and ask a Pratt & Whitney Direct-Factory Gage Specialist to analyze your needs and submit his recommendations.

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MACHINE TOOLS • GAGES • CUTTING TOOLS


that any change in them will be for the better!

The foregoing is substantially the views expressed at a works discussion group meeting. The ultimate findings? An excellent, constructive idea, provided that machinists and setup men are asked to volunteer, and that acceptances are hand-picked by competent selectors.

C Donald
*Lanarkshire, Scotland*

## ABOVE REPROACH?

*Has a foreman lost the respect of his men if they feel free enough to kid him about something that happened outside the shop? Is this a sign of undue familiarity that should not be tolerated?*

SOME SUPERVISORS and foremen continually gripe. Instead of looking for good qualities they look for faults. They build up resentment and discord in the plant. Minor grievances snowball beyond their level.

The staff head is there to help, aid, and advise. He makes decisions consistent with the laws and policies of the company. He is a leader, not the enforcer, and does not try to run the lives of others. He has no authority over the workers after working hours. He can advise, but not order good behavior on the employees' part outside of working hours. If the worker does a good job for the company his leisure hours are his own to do as he pleases. It is a waste of time and energy to worry about a man's conduct outside of working hours.

How can any staff head get ef-

*"I guess I have been driving you too hard, Alvin. I'd better take a couple of weeks off."*

# APEX *"fast lead"* SOCKETS

**SOCKET AND NUT FULLY ENGAGED IN 1/6TH OF A TURN!**

## *the socket that's "on" in a split second!*

Put an Apex "fast lead" impact socket on one of your power tools and turn on the power. Now, with the tool running, bring it right down on the nut, without the slightest hesitation. There! . . . the socket is "on" in one smooth, uninterrupted motion, fully engaged almost instantly upon contact! And you can do the same thing on nut after nut, without ever stopping and starting the tool.

Continuous, full-speed operation of power tools, made possible with Apex "fast lead" impact sockets, can help you make important savings in time and labor on any production fastening operation. Whether you use single tools or multiple units, you should have these new Apex impact sockets working for you.

Apex "fast lead" impact sockets are available with hex broached openings from 3/8" to 1". These, and over 5,000 additional Apex stock nut running tools are described in our Catalog 29-R. Write, on your company letterhead please, for your copy.

*Ask* **APEX** *for the answer to your nut running problem!*

**THE APEX MACHINE & TOOL COMPANY**
1026 S. Patterson Blvd. • Dayton 2, Ohio

*Another of the Reasons Behind Brad Foote Quality—*

# METALLOGRAPHY

• The heat treatment a gear receives is probably the most important single factor in determining its long range wear characteristics. Here at BRAD FOOTE we pride ourselves on having equipment designed to provide the widest possible variety of heat treatments.

• But in addition to standard heat treating and testing equipment we have a few extra safeguards. One of these, rather unusual in our business, is a complete Metallographic laboratory. Specialized equipment allows us to examine or photograph the grain structure of all of our metals, in order to determine the most effective methods of heat treatment and to serve as a check on the quality of finished work.

• Metallographic examination is just one of the many reasons behind BRAD FOOTE quality. Prove to yourself the savings this extra quality can mean. Let us quote on the gear requirements for your next program, without obligation.

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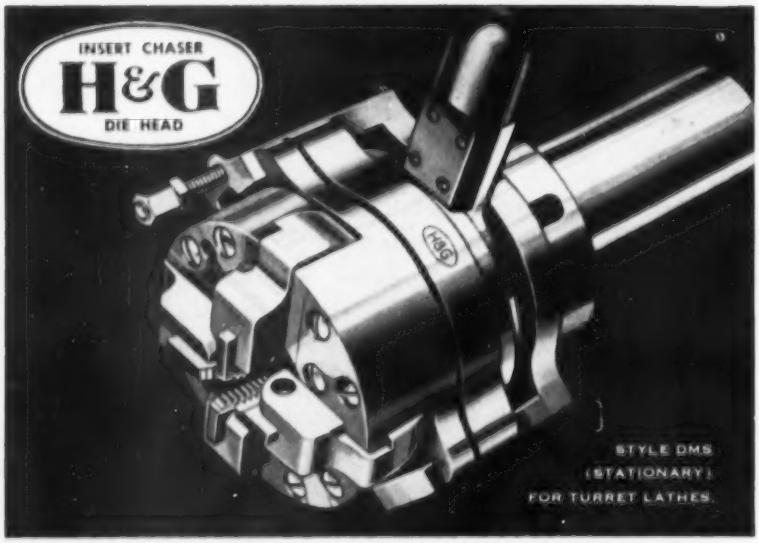
INSERT CHASER
**H&G**
DIE HEAD



STYLE DMS (STATIONARY) FOR TURRET LATHES

STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

*This die head is unique*

**THERE IS NO OTHER LIKE IT**

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: *their cost is so low they can be even thrown away when dull.* For example, for less than $45 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "UNIFIED AND AMERICAN SCREW THREAD DIGEST" sent free on request.

**THE EASTERN MACHINE SCREW CORPORATION** 20-40 Barclay St., New Haven, Conn.

fectiveness in quality, production, policy, or practice if he is going to worry about what the employee is doing after hours? The staff head should seek every opportunity to be of service to the employees. The good leader knows the quickest way to get into trouble is to carry tales and gossip. My advice to this foreman is to mind his own business and not jump at conclusions.

A E Salmons
*Norristown, Penna*

## ABOVE REPROACH

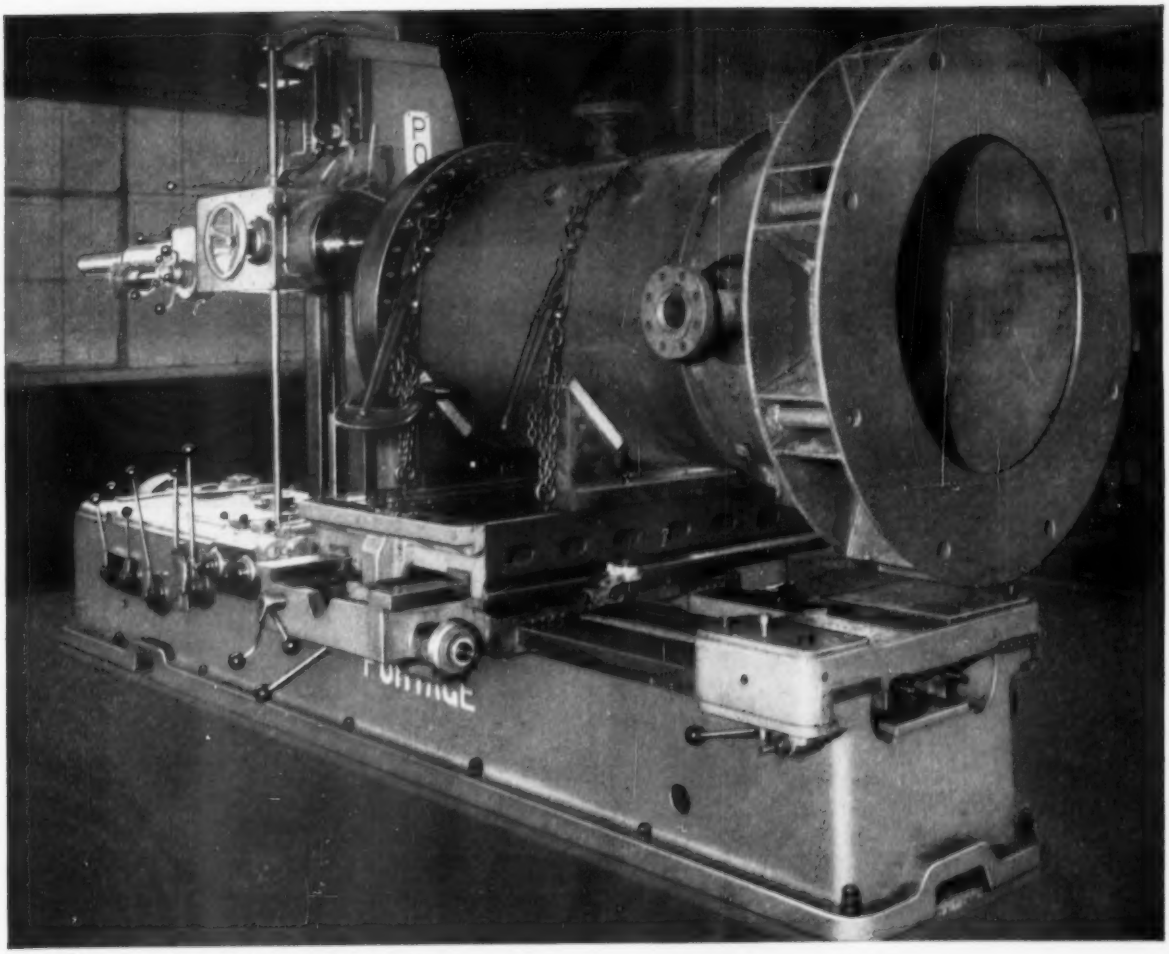
In our childhood we are subject to constant reprimands, advice, and correction. We are continually under the surveillance of our parents and teachers. We accept it through necessity, but frequently grow to resent it.

As we grow older we become increasingly independent, and develop a confidence in our ability to reach our own decisions. This confidence grows with time, and with constant practice. The infrequency of corrections and the lack of ability to see our errors also serves to convince us of our capabilities. Once we get into this position, it takes a person of great temerity to even attempt to point out our faults.

If Al has a lot of ability at handling people, and feels that the situation warrants the risk, he can speak to Nelson. However, a single episode like this does not indicate a trend; I believe that the best procedure would be to let it slide by. It is possible that speaking to Nelson may result in a row of more serious and lasting results than the incident proper.

The possibility of results of a

*"Just what kind of singing is it you do at your work, Mr. Botticelli?"*



Photograph courtesy of Western Supply Company, Tulsa, Oklahoma

# *Read* what this man has to say about PORTAGE MILLS!

Mr. D. W. Brady, Plant Manager of Western Supply Company, Tulsa, Oklahoma says,

"Our manufacturing facilities here at Western are devoted almost entirely to heat exchanger production. We have found the versatility of the Portage Mills allows us to do a wide variety of machining operations required in the fabrication of this type of work. We have found the machine to be very reliable and have experienced no lost time for repairs since it was installed."

Mr. Brady's kind remarks are typical of those coming in from across the country . . . PORTAGE MILLS are truly the *machine of the year* . . . and remember . . . Portage costs less to buy. Write for the illustrated catalog . . . and ask for a proposal too!

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*BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916*

WHAT'S THE
BEST WAY TO STRIP
METAL PARTS
IN LARGE VOLUME?
*See page 9*

*Are you looking for better methods for stripping paint?*

Do some finishes resist your present stripping methods? Do rejects pile up and cause a bottleneck in your production line? Do you have trouble stripping vertical surfaces of large products?

Oakite's FREE booklet on "How to STRIP PAINT" will help you find more efficient procedures. You'll want to read more about:

¶ What's the best way to strip paint from metal parts too large to be soaked in tanks? *See page 3.*

¶ What's the best way to strip large areas of structural metal where a steam supply is available? *See page 5.* Where steam is not available? *See page 7.*

¶ What are the best ways to prepare stripped metal for repainting? *See page 11.*

¶ What strippers are best for removing oil-base paints? . . . Synthetic enamels, alkali-resistant plastics or resin-based paints? . . . Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See page 12.*

**FREE** For your copy of "How to STRIP PAINT" just write or mail the coupon.

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deleterious nature must be weighed against the possible benefits before AI takes any action. In this particular case, at its present status, it appears that the possibility of a net loss exceeds the chance of a gain. I believe AI should await further developments.

Ernest Jones
*Bronx, NY*

## ABOVE REPROACH?

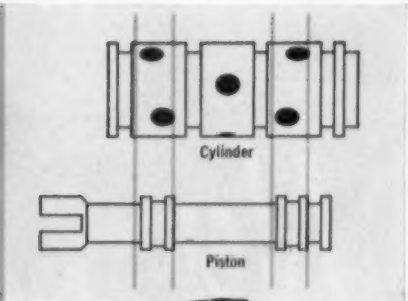
Are you an idol to be worshipped by all your employees—one who is held in awe and is not touchable? Does this practice make your job easy, and are you successful as a foreman with this condition existing? If the answer is yes to all questions, then certainly you are an unusual foreman. Naturally every foreman wants to be respected, and must command attention in order to get the proper work accomplished. Yet there is no reason why he must become so remote, so distant and aloof that he cannot mix with his workers.

In fact, to be a good foreman he *must* mix, at least to a point, with his employees. He must know them, their problems, and how they think and act. If he can do this, then he will be one of the very exceptional and successful men whom higher management will notice and promote.

Here we have a foreman who, for some reason, takes a female employee home. Reason? None given. So why suspect the worst? We find that his men know him well enough to make small talk about it to him. We find two other foremen who apparently don't have as close contact with their group or if they do, not to the same extent. Always remember that each of us has a different make-up. Some men can command

(Continued on page 268)

# MATCH PISTON LANDS TO CYLINDER PORTS PRECISELY WITH SHEFFIELD'S MICRO-FORM GRINDER



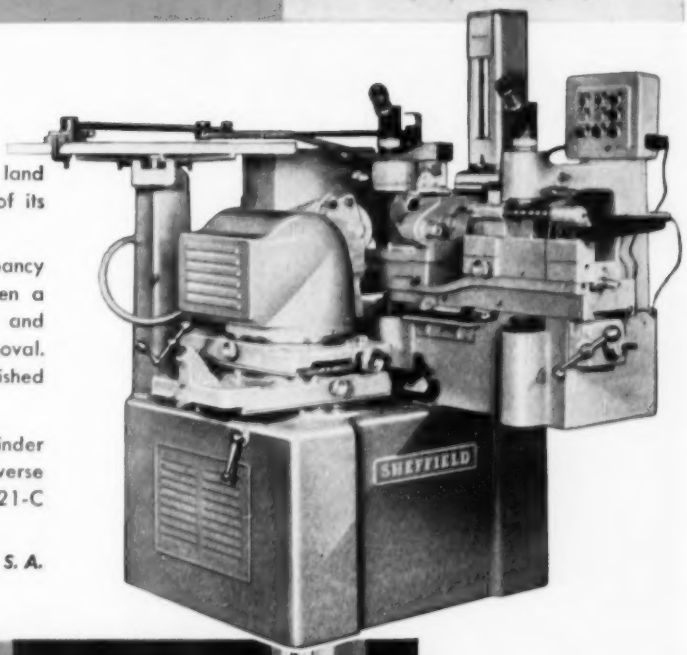

This servo cylinder and piston are typical of the very precisely machined hydraulic components in aircraft propeller and flight control systems.

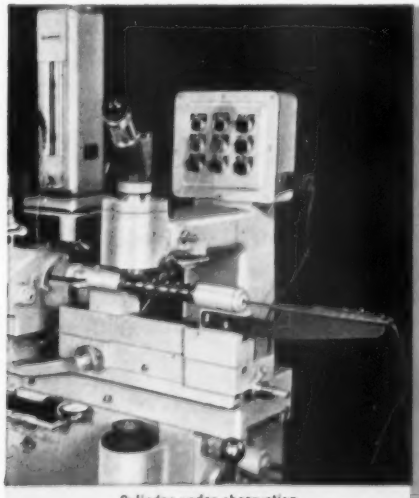
With the actual cylinder as a reference, each piston land is individually ground to match the inside edge of its respective cylinder port.

If a flow test then reveals the slightest discrepancy between land and port edge, the piston is given a finishing touch, using a Sheffield Precisionaire and Airetest Indicator to show progress in stock removal. Thus, the correction of the land face can be accomplished to within ± .000010".

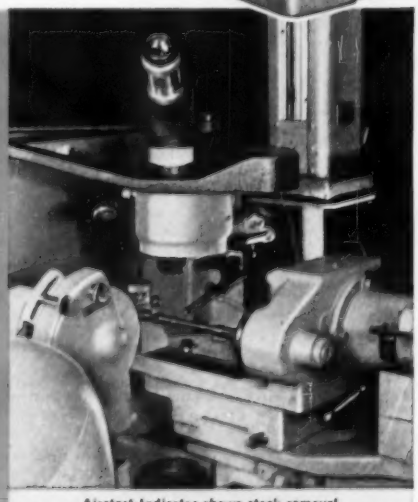
This is typical of the wide range of Micro-Form Grinder applications in duplicating precision profiles or reverse profiles from a master. Write for Bulletin MFG-121-C to Dept. 1.

***THE SHEFFIELD CORPORATION, DAYTON 1, OHIO, U. S. A.***



Cylinder under observation on auxiliary table.



Airetest Indicator shows stock removal in final correction.

7560

GOLDEN ANNIVERSARY

SHEFFIELD

manufacture and measurement for machine

# New Major Developments

## from Henry & Wright and V & O Press

. . . for extending economics of progressive stamping

. . . for faster, safer feeding with geared presses

## NEW HENRY & WRIGHT Double-Crank DIEING MACHINES

Here's a new H & W development designed to reduce the unit cost of metal stampings. Engineered to bear loads encountered in long progressive dies while maintaining precision registration of punch and die, H & W's Double-Crank assembly also offers you greater flexibility in ratio of die bed to press capacity. Thus you can: (1) form larger parts with lower capacity machines than before possible; and (2) handle stampings requiring high pressures with greater precision and longer die life than before. Special features of the new H & W Double-Crank machines include:

## NEW V & O One-to-One FEED-O-MATIC

Now you can equip your geared pneumatic clutch presses with V & O Feed-O-Matics and gain all the advantages of precision automatic feeding — increased production, greater personnel safety, and precision quality control. The Feed-O-Matic for geared presses is driven directly from the drive shaft on a one-to-one ratio. Mechanical "fingers" of the Feed-O-Matic lift parts up, over and into the die for precise placement. High cost tools can be used with less fear of breakage and stop motions are eliminated. Write today for complete information.

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***H & W – V & O***

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CLEVELAND, OHIO
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DALLAS, TEXAS
Machine Tool Associates, Inc.

DAYTON, OHIO
The Match & Merryweather Machinery Co.

FERNDALE, MICH.
The Match & Merryweather Machinery Co.

INDIANAPOLIS, IND.
C. C. Garrett Machinery

KANSAS CITY, MO.
Bryant Machinery & Engineering Co.
c/o Fuchs Machinery & Supply Co.

LOS ANGELES, CALIF.
Harron, Rickard & McCone Co. of Southern California

MILWAUKEE, WISC.
Bryant Machinery & Engineering Co.

MINNEAPOLIS, MINN.
Bryant Machinery & Engineering Co.

MUSKEGON, MICH.
Bryant Machinery & Engineering Co.
c/o Lakeshore Machinery & Supply Co.

NEW YORK, N. Y.
Rudel Machinery Co., Inc.

OMAHA, NEB.
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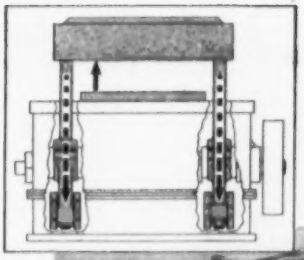
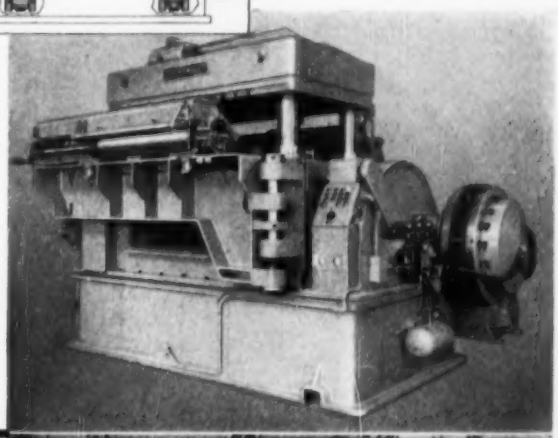
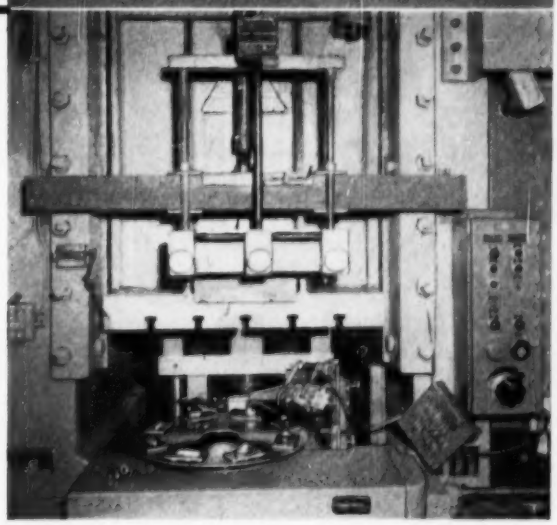


New 350-Ton Dieing Machine. Insert drawing shows advantages of new Double-Crank assembly.

(1) Completely enclosed to prevent chips, slugs, stock lubricating compound and other foreign matter from entering and damaging working parts; (2) A self contained recirculating lubrication system; (3) Large area chutes at front and rear for disposal of finished parts, scrap slugs and installation of stackers; (4) Swing-out type roll feed, solidly supported on knees when in operation; (5) Roll feed driving mechanism completely enclosed; and (6) Crosshead adjusting mechanism is conveniently located within the upper crosshead for easy accessibility. Write today for complete details.





The Feed-O-Matic® is simple and self contained, well enclosed, but highly accessible for servicing.

***Behind each Henry & Wright - V & O representative are two engineering organizations geared to work out problems ranging from simple blanking to automated "packaged" presses. He will fit into your production planning team like the "pro" he is . . . adding his experience to yours in terms of your requirements.***

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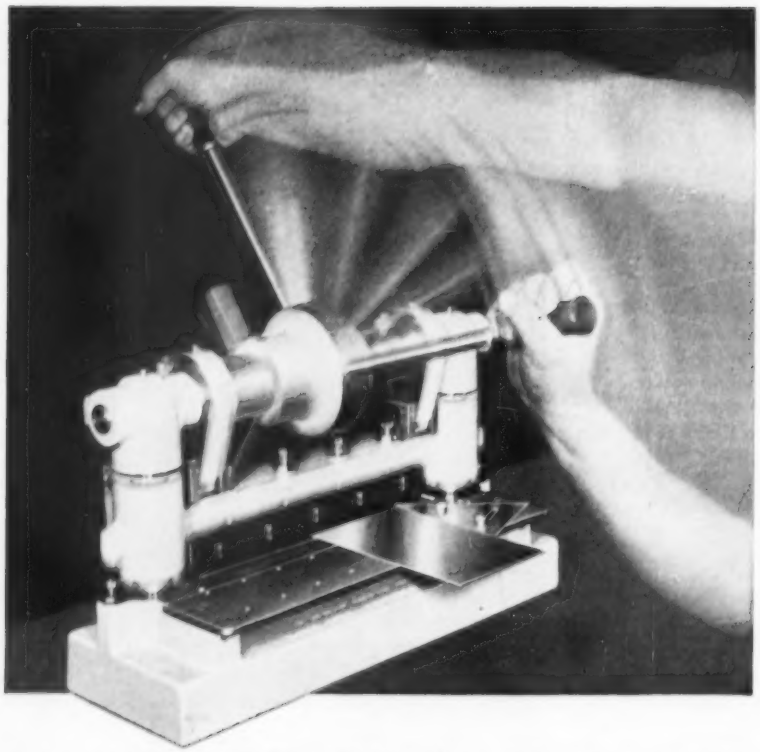
**THE V & O PRESS CO.**
HUDSON, NEW YORK



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***Check these features and you'll want a* DI-ACRO* SHEAR**

- **PRECISION**—strips less than .025" wide accurately sheared. Thousands of parts exactly duplicated.
- **CUTTING SPEED**—rivals power machines.
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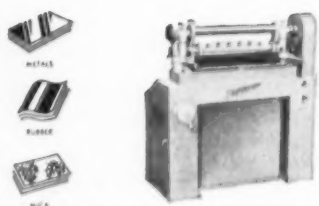
- **ENGINEERING SERVICE**—at your disposal for the life of the Shear.
- **PORTABLE**—readily moved about.
- **RUGGEDLY BUILT**—made with best of materials, backed by warranty.
- **DELIVERY**—immediate on most models.
- **COST**—that's good too.



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Advanced design, variable speed, compact, precision construction. Continuous shearing from 30 to 200 Strokes Per Minute. Non-repeating safety clutch allows "Single-Stroke" operation when desired. Vari-O-Speed and Standard Models, in 12 and 24 inch shearing widths.

**WANT MORE INFORMATION?**

New catalog gives complete details on all hand power operated Di-Acro machines.

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*Creators of "Die-Less Duplicating"*

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di-acro PRECISION METALWORKING MACHINES


respect and accomplish the unheard of by being soft and easy-going with workers. Others cannot, and even with the high-handed attitude that is taken, they still fail.

There is no right or wrong way. It can only be said that the best way is to have an easy manner with your workers and know them better than they know themselves. To be able to meet all conditions and still get the work out is a definite requisite. Above all, if you are successful in your handling of employees, then don't change just because Bill or Joe doesn't think you are going at the problems in the right way. What *you* can do, perhaps he cannot but wishes that he could; his individual traits prevent it.

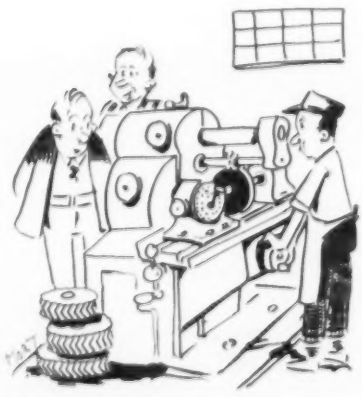
What goes on in a department, so long as it does not affect the output of the department, or so long as it is not contrary to company policies, should be of little or no concern to other departments unless a great deal of contact is had by the others with that department. Then, perhaps, a little concern must be given and foreman-cooperation is required.

Don't run the other fellow's department, and don't worry about the jokes he has played on him by his workers. All reflection is on his department.

Charles D Townsend
*West Hartford, Conn*

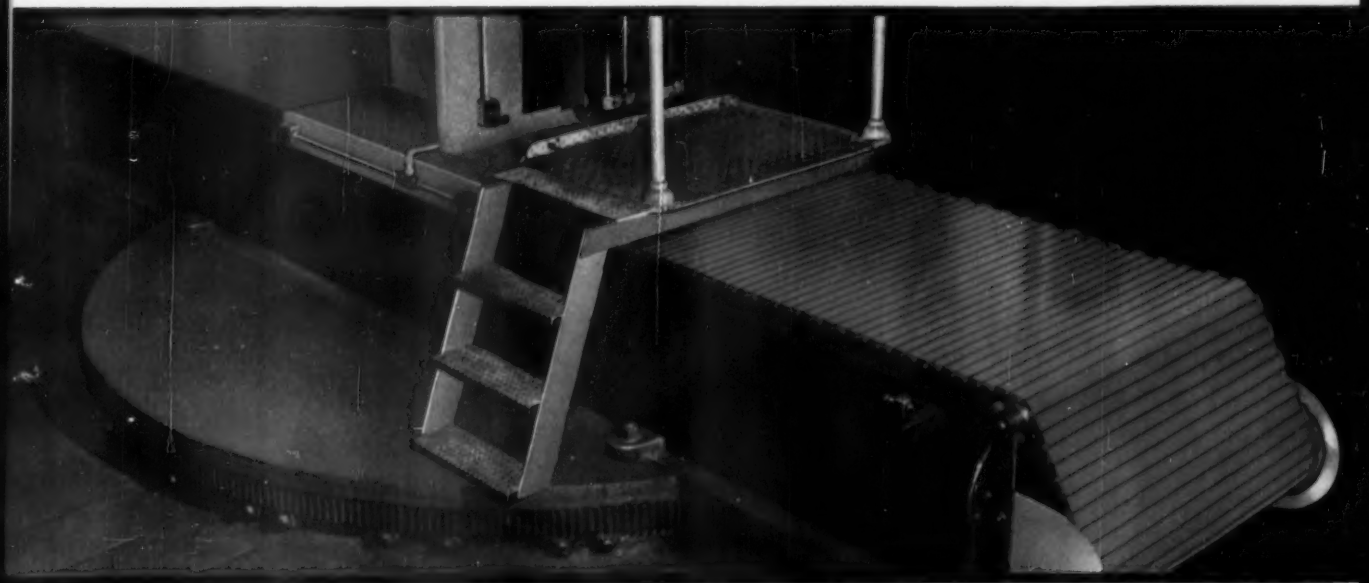
## ABOVE REPROACH

The foremen in a plant are all members of a team; they are individually and collectively responsible for the success or failure of the group. As a team they share in the prestige of the plant's success. As individuals they each share in the reflected light of the success of a member of their team. By the same token this arrangement precludes the possibility of any member or group of members



*"We cut herringbone gears on Fridays."*

# Futurmill "Way-Life" Covers– Made Better for Less with Reynolds Aluminum Extrusions



Engineers at Futurmill, Inc. of Pontiac, Mich. and Reynolds Designers put their heads together to take advantage of the amazing flexibility of aluminum extrusions . . . to make "Way-Life" Covers provide better protection for machine ways . . . at lower cost.

The result of this cooperative effort: 1½" wide interlocking extruded slats of 6063-T5 aluminum—flexible enough to provide custom made covers of any length or width—covers that roll up compactly at either end of a machine. They are strong yet lightweight . . . strong enough for machine operators to walk on safely for job set-up . . . light enough to make covers easy to install. They will not stretch or tear . . . hot chips will not burn them.

Fabrication of the covers simply requires cutting the slats to length, riveting a small section of another aluminum extrusion to the ends of every other slat—to prevent sideway movement—and assembling the interlocking slats. Reynolds engineers designed the aluminum end extrusion to replace a casting—at a savings of $0.05 per piece.

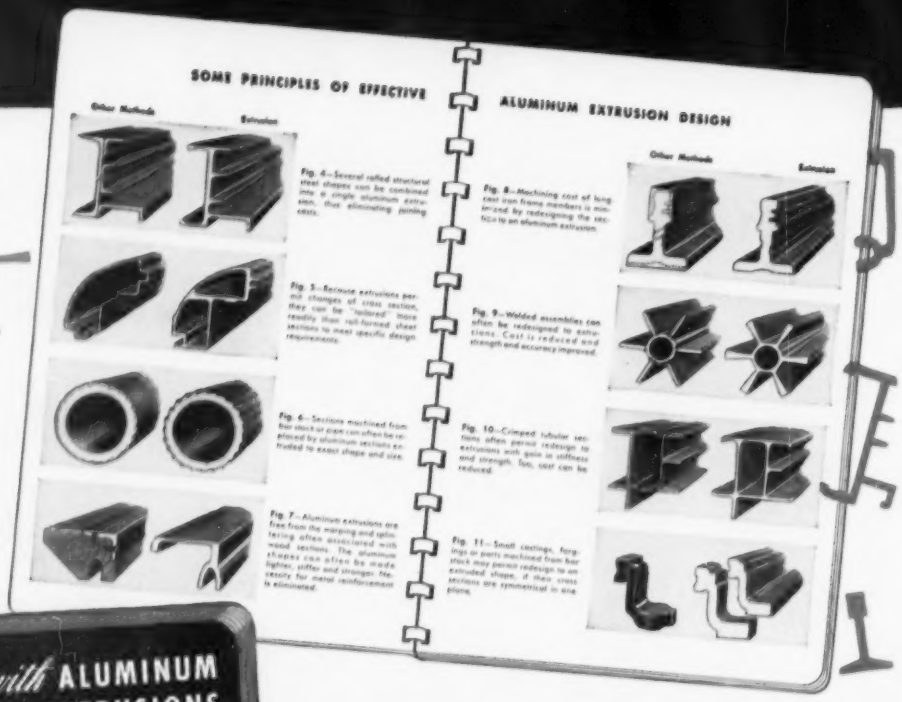
Consider improving your product with aluminum extrusions—from Reynolds. Remember, aluminum extrusions offer infinite *flexibility* of design . . . and Reynolds engineers offer invaluable *experience* in design.

For more information about aluminum extrusions and Reynolds Design and Engineering service, consult the nearest Reynolds Office listed under "Aluminum" in classified telephone directories. Or write *Reynolds Metals Company, P. O. Box 1800-JJ, Louisville 1, Ky.*

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

See Reynolds New Program, "Circus Boy", Sundays on NBC-TV

# How to Take Advantage of Aluminum Extrusions


SOME PRINCIPLES OF EFFECTIVE
ALUMINUM EXTRUSION DESIGN
Other Methods
Extrusion
Fig. 4—Several rolled structural steel shapes can be combined into a single aluminum extrusion, thus eliminating joining costs.
Fig. 5—Because extrusions permit changes of cross section, they can be "tailored" more readily than roll-formed sheet sections to meet specific design requirements.
Fig. 6—Sections machined from bar stock or pipe can often be replaced by aluminum sections extruded to exact shape and size.
Fig. 7—Aluminum extrusions are free from the warping and splintering often associated with wood sections. The aluminum shapes can often be made lighter, stiffer and stronger, frequently for metal reinforcement is eliminated.
Fig. 8—Machining cost of long cast iron frame members is minimized by redesigning the section to an aluminum extrusion.
Fig. 9—Welded assemblies can often be redesigned to extrusions. Cost is reduced and strength and accuracy improved.
Fig. 10—Crimped tubular sections often permit redesign to extrusions with gain in stiffness and strength. Too, cost can be reduced.
Fig. 11—Small castings, forgings or parts machined from bar stock may permit redesign to an extruded shape, if their cross sections are symmetrical in one plane.

## 138 Page Reynolds Handbook Shows How to Increase Design Efficiency ...Lower Production Costs

Limitations of rolled structural shapes, formed sheet sections and machined, cast or welded parts are soon forgotten when you thumb through the authoritative handbook, "Designing With Aluminum Extrusions." The many important advantages obtainable with extrusions are shown in the above pages reproduced from the book.

Extrusion dies are inexpensive, so special shapes that use the metal most efficiently can be produced economically. The handbook shows how . . . with 126 illustrations and chapters on Features of Aluminum Extrusions; Examples of Effective Extrusion Design; Manufacturing Possibilities; Shape Design from Manufacturing Standpoint; Structural Design Considerations; Finishes; Cost Factors and a wealth of other essential data.

Your free copy of "Designing With Aluminum Extrusions" is available, along with a complete index of other helpful Reynolds literature, when requested on a business letterhead. Simply write to *Reynolds Metals Company, P. O. Box 1800-JJ, Louisville 1, Kentucky.*

*See Reynolds New Program, "Circus Boy", Sundays on NBC-TV*

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

feeling complete immunity from the consequences resulting from objectionable conduct on the part of one of the team.

The employees respect this group because of their position as foremen. As part of it, Al and Ed have a right and an obligation to judge Nelson's conduct. If they conclude that his actions are not what they should be, and that they may be detrimental to the esteem which the employees have for the group, they are entitled to speak to him about it. They cannot be expected to remain silent, for his actions are injurious to their position.

William Martin
*Brooklyn, NY*

### ABOVE REPROACH?

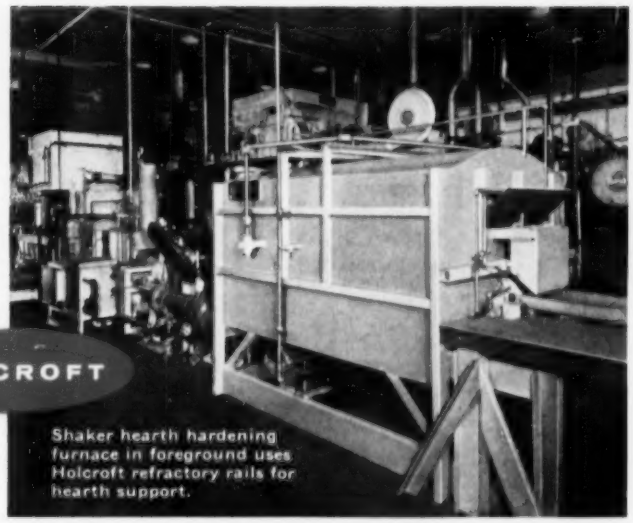
EVERYONE should, as a social gesture to society, try to be above reproach but it's an awful, high standard to aspire to. In the case of foremen handling male and female labor, its a darn sight harder, well nigh impossible. It depends on the charm of the female and the susceptibility of the male. Charm in a woman can be a menace in the mixed factory.

At the risk of seeming old womanish, I am in complete agreement with Al's philosophy in this matter. Ed's light-hearted dismissal of the talk about Nelson and the blonde is rather like the easy out. It is not just as simple as Ed pretends to think. "Above reproach" is asking too much, so many of us fall by the way, not necessarily concerning women, only. But, while being above reproach is almost too difficult for most of us, all of us can take sensible precautions to give no excuse for idle and slanderous chatter concerning our actions and conduct in general.

It is always a safe plan for executives handling labor to be as impersonal as possible without being completely remote or standoffish. "Familiarity breeds contemp" is as true today as when first proclaimed, and every executive of ripe experience knows full well how inconvenient, even embarrassing, a shop or office friendship can be if formed between the chief and one of the "other ranks."

This, between men and the boss, is open to question; it is often the very devil between the chief and a *woman* employee—something to be avoided at all costs. Discerning male executives make a point of steering clear of entangling affairs with those of the opposite sex whom they may have to supervise. It is said there's no fool like an old fool but, fortunately, in my experience, the old-


BLAZING THE HEAT TREAT TRAIL— WITH HOLCROFT



Shaker hearth hardening furnace in foreground uses Holcroft refractory rails for hearth support.

LET'S TALK ABOUT

REFRACTORY RAILS

With the current shortage of nickel, furnace manufacturers are looking for ways to replace or conserve this scarce commodity. It is interesting to note that Holcroft tackled this same problem during World War II when a nickel shortage also faced the industry.

In 1945 we designed and installed a pusher tray gas atmosphere furnace that used refractory skid rails instead of the nickel chrome alloys used at that time. Since then we have expanded their use to many other comparable applications so that now there is positive proof that properly designed installations of refractory skid rails last much longer, under similar conditions, than those made from nickel alloys. Replacements have been negligible—performance has been superior—material costs have been lower—and a marked decrease in wear on work carriers has been noted.

Yes, today a nickel shortage still exists—but Holcroft offers a job-proven answer, not only for the rails but for other vital parts of a heat treat furnace as well. You can bank on Holcroft's engineering leadership and experience—the kind that saves not only nickel—*but dollars, too!* Write for information.

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PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • DARIEN, CONN. • HOUSTON, TEXAS • LOS ANGELES, CALIF. • PHILADELPHIA, PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario

# NEW *all-steel* ERIE

# RIGIDROP

## *New design piston-lift gravity drop hammer with*

### New variable stroke control

### More guiding surface for closer-tolerance forgings

### Safety-streamlined, economical all steel construction

Experienced hammer operators will take quickly to the definite working advantages of this new Erie Rigidrop. It is a brand new concept in a simple-to-operate all-steel production hammer—striking more blows per minute, more easily, and with finer control than ever before realized. Certain shops will find this the most economical hammer they can use in their operations.

Most appreciated in Rigidrop's action is its ability to control stroke variation. This is not simply a short stroke feature, but a *new variable stroke control* allowing you to get *all the range* of strokes between the conventional short and long. Its treadle operates as simply as the accelerator on your automobile—for short fast blows, just press lightly; for longer strokes, apply more foot pressure as desired. And . . . your operator can instantly shift from short strokes to longer, and shift back again just as quickly.

There are many more features of the Rigidrop which will appeal to cost-conscious shops. We'll gladly have an experienced Erie Foundry representative call on you to explain its application—just ask.

## *Now available in sizes 1500 thru 5000 lbs., inclusive*

**40% more guiding surface**—New Erie guide arrangement provides more accurate guiding of ram and continued maintenance of die adjustment.

**Adjustable guides**—Guide-Ram adjustments easily made from front and back of Rigidrop at close-to-floor level. Ram can be removed from the hammer at die level, without jacking.

**Safety designed throughout**—No loose linkage, no overhanging parts on the front of the Rigidrop. An air cushion head provides added protection if the hammer is overstroked.

**Built-in inching mechanism**—For easy die setups.

**Better clamping system**—Clamp faces are directly opposite one another to give positive clamping action without bending the rod.

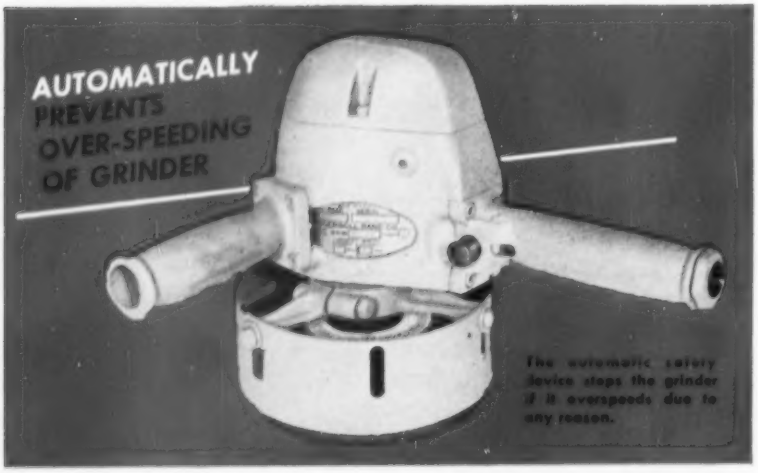
**Minimum down time**—Never any board replacements.

*SINCE 1895—THE GREATEST NAME* ERIE *IN FORGING HAMMERS*

**ERIE FOUNDRY CO. ERIE, PA.**

# NEW

## THE ONLY SURFACE GRINDER with a POSITIVE SAFETY SHUT-OFF!




**PLUS THESE OTHER COST-SAVING OPERATING ADVANTAGES:**

- Handles can be set at 90° or 120° for close corner work and operator comfort . . . another Ingersoll-Rand FIRST!
- A responsive governor insures maximum cutting speed and minimum air consumption regardless of load.
- Single point lubrication, double-sealed wheel bearings, large oil reservoir for long life, low cost operation.
- Top of tool is flat for easy pressure application.
- Available in 2 Models and 4 speeds as follows:

  Speeds: 3100—4100—4500—and 6000 rpm.

  Size 41F with push-locking throttle for constant operation.

  Size 41FX with self-closing, safety type throttle.

Ask for a demonstration of this new safety grinder in your shop.

B-343

**Ingersoll-Rand**

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er, steadier executives seldom give cause for complaint.

We cannot, of course, put old heads on young shoulders. It is usually the embryo foreman or manager who falls for the pretty face and captivating manner.

Playing with fire can be a joke fraught with serious consequences. If Nelson's "Lady Hamilton" regards the escapade as a joke and if Nelson enters into it in the same spirit, it can, except for a few sly leg pulls, safely be forgotten. It can be regarded an indiscretion on Nelson's part if he is a young or a youngish foreman, but even young foremen cannot afford the luxury of too many indiscretions of that nature. Again, we must not overlook the influence of the blonde. Every Nelson who philanders cannot hope for a Trafalgar; repeated indulgence may result in a Waterloo.

Those remarks are prompted by a recent unfortunate happening in my own circle of friends. A business friend, managing a small, soft goods manufacturing business for the deceased owner's family, lives out in the country and motors in to town each day. Living on the fringe of the town is one of his girl machinists whose home he passes in his way to and from the factory. For a couple of years he has been driving her out and in. This caused mild comment. He is a douce, married man with an attractive wife and a nice young family. Some time ago he confided in me that the girl was in trouble with a married man who had absconded to Australia.

After the usual leave of absence, the girl is now back at her machine. No one seems to know the culprit who absconded and the unfortunate

*"OK, George, knock it off—it's quitting time!"*

girl does not seem to have had any special male friend. All who intimately know the now suspected manager are convinced that he is not implicated; but those who don't, and only hear the gossip, are less charitable.

It is not difficult to picture the misery and remorse arising from thoughtless conduct. No matter if he is completely innocent, his wife and family suffer for his stupid, if well-meaning actions. He is wretched and contrite, all to no purpose. It will take years to be forgotten. The moral is, men supervising women will be well advised to concentrate on business and not get mixed up with their personal affairs. Mostly, women are quite able to look after their own affairs and, so far as male bosses are concerned, they should be left to it.

In his condemnation of Nelson's frolic on thin ice, Al really is minding his own business. He is manifestly concerned about the dignity of foremanship and has expressed his concern in no uncertain terms. His views on the subject may seem stuffy and drab, but we must remember that all that glitters is not gold. I cannot resist the conclusion that Ed is arguing with his tongue in his cheek.

Anyone in doubt in this matter might apply a simple test, "Would I be happy were the blonde my daughter?" I assume Nelson to be a married man. If not, his frolic may be regarded as a mild flutter of youthful wings, foolish in a foreman, none-the-less.

C Donald
*Lanarkshire, Scotland*

"ABOVE REPROACH?"

"SUSPICION is far more apt to be wrong than right; oftener unjust than just. It is no friend to virtue, and always an enemy to happiness."

That statement was made many years ago, and it will always ring true. It should have special significance where leaders of men are concerned. They should be above suspicion or reproach. Certainly a foreman should be a leader in moral conduct, both in and outside of the shop, if the taint of suspicion is to be avoided. A person's basic character is not shown by the company he keeps, but by the reason why he keeps such company. In this connection, officials and supervisors of a company have legitimate and necessary reasons for keeping their personal relations on a basis above criticism. Their positions demand integrity of character. Analogous to this situation is the fact that a

15,000

3/4" bolts uniformly tightened to 60 ft. lbs.

TORSION BAR with new Ingersoll-Rand

*Torque Control* IMPACTOOL

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| PROBLEM: | Assembly of 1390 mechanical pipe joints involved over 15,000 ¾" bolts. The problem was to speed assembly, remove guesswork and assure proper tightness of all joints. |
| AIR ENGINEERING SOLUTION: | A new Ingersoll-Rand Size 5040T Torsion Bar Torque Control Impactool, preset to deliver 60 ft. lbs., was put on the job. |
| RESULT: | The Torque Control Impactool automatically shut off at the preset Torque . all guesswork was eliminated . . . uniform joint tightness was produced . . . an average of 10 minutes per joint was saved . . . smaller bell holes were required due to compact size of the 5040T this one tool produced an extra profit of $404.25 on this job. |

You can put these new "Torsion Bar" Torque Control Impactools on your nut running jobs and reap these benefits: Positive Torque Control . . . Simple Torque Setting . . . Setting remains constant . . . No pressure regulators needed . . . No operator training.

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Choice of genuine Chrome Clad or slip-proof black crackle frame.
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When anvil and spindle faces become worn, adjustment takes only a few minutes and *reading line retains its original position.*

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Every personal preference, every job requirement can be met in the complete range of sizes and models in the Lufkin line.

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company is known by the men it keeps. A good company will not keep a supervisor who fails to get the best efforts from his men and lacks their cooperation and respect because of his dubious personal relations with one of his female employees.

It is a fact that human nature being what it is, a man is often judged by his personal inclinations rather than his justification for such inclinations. This is especially true in the case of a supervisor. His personal activities are usually a source of interest to his men, and should be above suspicion and reproach. When such extra-curricular activities and personal inclinations on the part of a foreman include having social contacts with one of his female employees, he can expect comment by his men, although he may feel that the matter does not concern them. Such actions by the foreman eventually lead to a lowering of respect for him on the part of his men, with consequent loss of employee morale.

As far as his men are concerned, the foreman lives in a house of glass, and he is expected to live an exemplary life. He may feel that what he does outside the plant should be of no concern to the workers. But such sentiment never did stop inquisitiveness and wagging tongues when innocent happenings are misinterpreted or scandal and notoriety arises.

There is a much misinterpreted truism which states "The best things in life are free." Fun being free, a foreman may feel he is entitled to a little of this freedom once in a while. However, when it comes to his having such freedom with one of his female employees, that's a horse of another color. A foreman doesn't indulge in that kind of freedom. The foreman's business is everybody's business, and his effectiveness as an executive is impaired when he intentionally muddles up his personal relationship with his employees by mixing business with pleasure.

A foreman who is so derelict in his duties and responsibilities as to endanger his own job and lose the respect of his own men by his conduct deserves cautionary admonition and advice from fellow foremen. It is their positions as supervisors that are also affected when one foreman gets into trouble of this nature. Loss of respect is contagious. It is the business of every foreman to step in and stop it at its source.

The errant foreman should be tactfully dissuaded to end his infatuation—alleged or real. He should

be made to see that the way of the careless brings not only no permanent satisfaction but also loss of respect, friends and material things. There should be no doubt that the foreman should be a leader in moral conduct, both in and outside of the shop. No foreman can be successful if he fails to keep his own backyard clean. Off-beat activities with out-of-bounds blondes can only lead to an eventual lowering of respect for him on the part of his men who are aware of his actions.

It's part of the human male frailty to catch the "seven-year itch" and play "wolf" and "ladies' man." I admit it's pretty hard to keep oneself immune from delectable distractions, but being a foreman requires a high moral code and submergence of personal inclinations—the best way to keep young ideas under control.

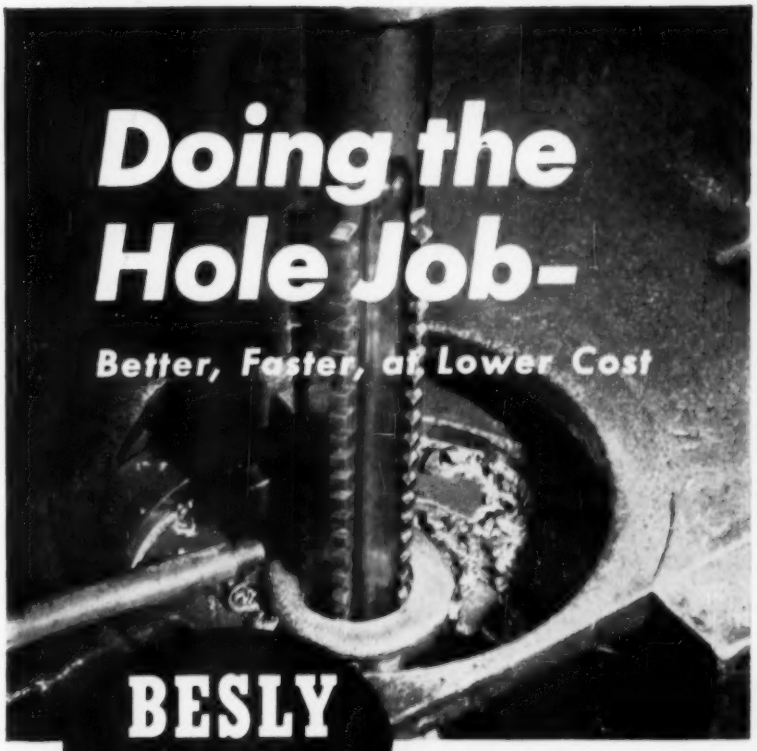
Harry Kaufman
*Philadelphia, Penna*

## WORKING THROUGH THE BREAK

*If a man doesn't feel like taking advantage of the coffee break, should he be asked to conform? Are the other workers justified in feeling that his apparent diligence makes them look like loafers?*

The main purpose of the coffee break is to afford the workers a period of mental and physical relaxation so that they may be conditioned for more effective application to their work. It is based on the idea that a tired mind and body becomes waterlogged through constant use, and is not as effective as one brought to a condition of vitality by total relief

*"You'll feel mighty envious if through spare time study, I show up one of these mornings independently rich."*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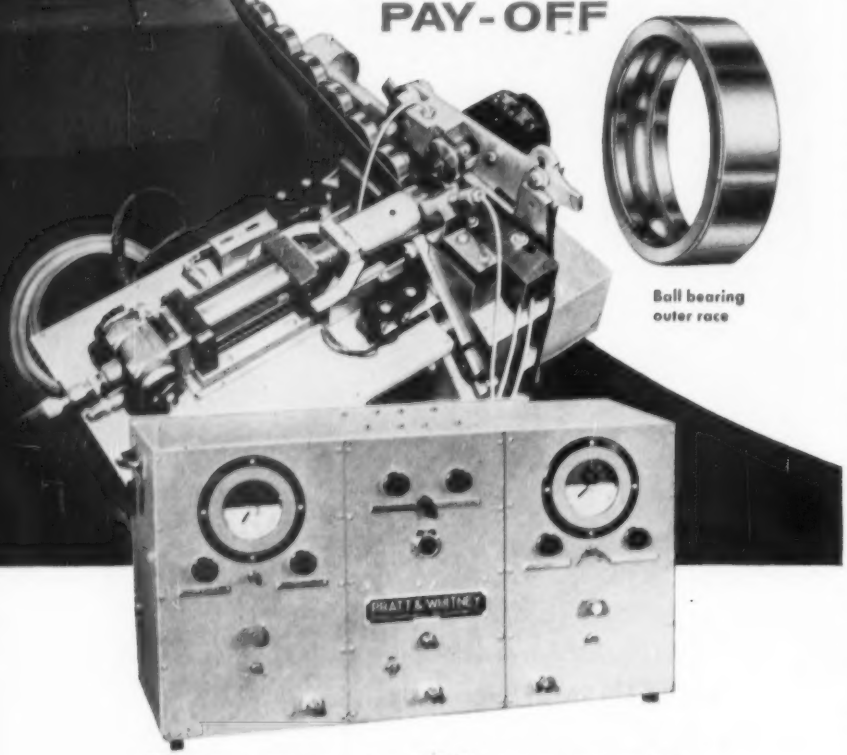
...Here's an
AUTOMATIC **3**-to-**1**
FAVORITE for a
**BIG**
**PAY-OFF**




Ball bearing
outer race

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If you're looking for the best bet in Quality Control, you can really "chute" the works on this outstanding new performer. Pratt & Whitney "In-the-chute type" Automatic Gages can handle the output of several high speed automatic machines.

Races fed by chute into the gage unit are checked for 3 dimensions at 1 time – size and taper and out-of-round at a rate of 2200 pieces per hour and automatically sorted into ok, undersize and oversize categories. If limits are exceeded, the Gage Unit automatically signals that a machine correction is required.

**DON'T GET LEFT AT THE POST...** in the industry-wide race to produce better and faster at lower cost. Learn *now* how P&W Automatic and Automation Gaging can put you out ahead of the field. Phone the P&W Branch Office near you and ask a Pratt & Whitney Gage Specialist to call . . . or write direct to West Hartford outlining your needs.

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MACHINE TOOLS • GAGES • CUTTING TOOLS

from the monotony of work. The idea is to wipe the slate clean through the medium of a drink and an entire change in thought environment.

We cannot be effective in coffee-break procedure if we allow each individual to have his say as to its application. The coffee-break period, as it is commonly known, is a general term used to designate the worker's relief time given him by his employer so that he can re-charge his battery, as it were. It makes no difference whether the medium of refreshment is coffee, tea, or a cup of hot Bovril—the sole purpose of the medium is the social relaxation wherein the employees gather around the urn to yak-yak, un-encumbered by the strain of rigid working conditions and restrictions. Unfortunately the yak-yak gets so involved at times that many find it impossible to shut it off when the proper time comes and, as a consequence, time marches on at the employer's expense. Maybe it would be a good idea to have a louder bell to notify the men that the break time has expired.

If one of the workers takes it upon himself to ignore the privilege granted him to refresh himself, he is killing the purpose of the whole idea. There are times, however, when a worker reaches a certain stage on his job where he hesitates to stop, and he feels that he would gain more headway toward its completion if he worked through the period of refreshment. Occasions like this are few, but they do arise at times. Naturally the other men do not know of the exact circumstances and are prone to complain about a man who seems to be doing the whole shop harm. I do not feel that it is up to the other men to say whether one should ignore the break under such

*"Saw an eye doctor yesterday . . . imagine him telling me I need glasses!!"*

# ACCURATE HONED HOLES ASSURE . . . QUIET, SMOOTH RUNNING PRODUCTS

Sunnen Honed Holes improve your product in many ways:

1. Holes in moving parts have round and straight load bearing surfaces from end-to-end . . . no "spot" wear!
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new
economies in
NYLON GEARS
means savings in gear costs up to 90%

Our many years of pioneering and successful production of Nylon Gears, plus new reduced mold charges, can now make even greater economies for you in the use of Nylon Gears. With the great variety in molds now possible, Nylon should not only be considered as an economy measure but the answer to many problems where a compact design is necessary. Nylon Gears are quiet, durable, efficient and need less lubrication – they mate perfectly with metal gears.

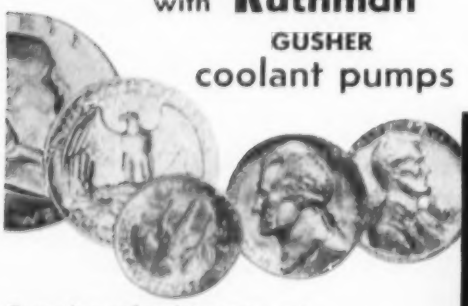
Let our engineers with more than a decade in gear experience show you how Nylon Gears can save you money – let us consider your gear problems during the design process–send blueprints or specs for prompt estimates.

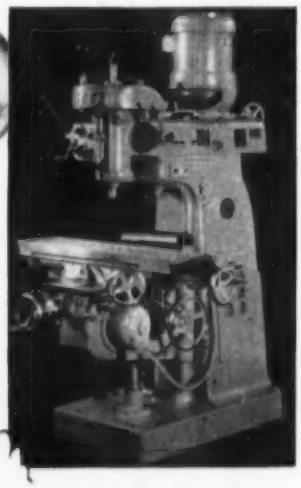
105

PROCESS GEAR CO., INC.
4618 W. Fullerton • Chicago 39, Illinois

SAVE TIME and MONEY
with Ruthman
GUSHER
coolant pumps

This milling machine, manufactured by George Gorton Machine Company, is equipped with a Ruthman Gusher Coolant Pump in back of the column.





Operating and maintenance costs are reduced when you specify Gusher Coolant Pumps. You get split-second coolant flow . . . controllable as to volume. There is no priming or packing needed. Heavy-duty pre-lubricated ball bearings and electronically-balanced rotating shaft give you long life with minimum cost of maintenance. We will be glad to advise you on your coolant problems.

Model 5-P 3

THE RUTHMAN MACHINERY CO.
1818 Reading Road
Cincinnati, Ohio

circumstances; this is the foreman's job, and it should be brought to his attention at the time, so as to eliminate any misunderstanding and its attendant gripes.

There are some who consider such things as coffee breaks as so much poppycock, and bull-headedly ignore the period and work right through. These are the people who cause all the trouble and one does not blame the rest of the crew for complaining about it. We cannot regulate the coffee period effectively if one takes it upon himself to ignore it. The question is whether the break in one man's work is to be considered as being of more importance than the benefits derived from the interval of relaxation as a whole.

In order that no friction be created by one or more working on through the break, I would feel that the break time should be compulsory. The period was created for a definite purpose, and in order that its workings be effective everyone should be obligated to participate. In the event of a rush job which has to be out at a certain time, there is a legitimate excuse for a man working through. I know how some of the shop boys look upon one who works on through and some of the remarks made wouldn't look good in print. There was one time when I was still working while the coffee break bell was ringing and one of the loud-mouth wisecrackers bellowed out "What're you doin'—scabbing it, or do you want to get in solid with the boss?" It may have been in jest, but it only goes to show how some of the shop men feel about one working through the coffee break. I don't blame the men for feeling the way they do when the employer sees

(Continued on page 282)

*"All I know is that Hasse sent in 50 cents and a cereal-box top."*

# ATTACHMENTS for *Bridgeport*

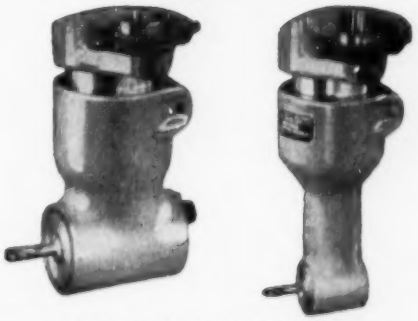
## TURRET MILLING MACHINES

### *add outstanding versatility to a machine already versatile*

WHEN you buy the BRIDGEPORT TURRET MILLING MACHINE, you buy more than a conventional machine of this type. You actually buy and get a machine in a type which has been conceived, created and developed by Bridgeport. In addition to the turret principle originated by Bridgeport, attachments have been designed which add a great many features to the machine so that its basic purpose for milling, drilling, boring and shaping has been extended to include also cherrying, right angle milling as well as copying with the Bridgeport Hydraulic True Trace Combination.

One of the outstanding advantages of this machine is that you can buy this basic machine with some or all of these attachments or add them later whenever the need arises for the handling of specific operations.

Investigation of BRIDGEPORT TURRET MILLING MACHINES and their many attachments is always in order.



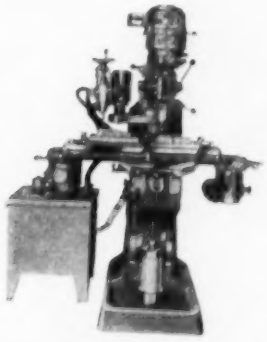
**RIGHT ANGLE ATTACHMENTS**

(Above) Heavy Duty . . . for milling and drilling at right angles; fits both Master and 1 HP Bridgeport Heads.

(Above) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities.

**CHERRYING ATTACHMENT**

Makes possible production of convex and concave shapes, ideal for producing drop forge dies, molds, cavities.



**TRUE TRACE COMBINATION**

The Bridgeport True Trace Combination will give excellent performance and save endless hours when copying irregular dies and molds.

**NO. 2 BORING HEAD**

Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

**Bridgeport MACHINES, INC.**

Bridgeport, Connecticut

*Manufacturers of High Speed Milling Attachments and Turret Milling Machines*

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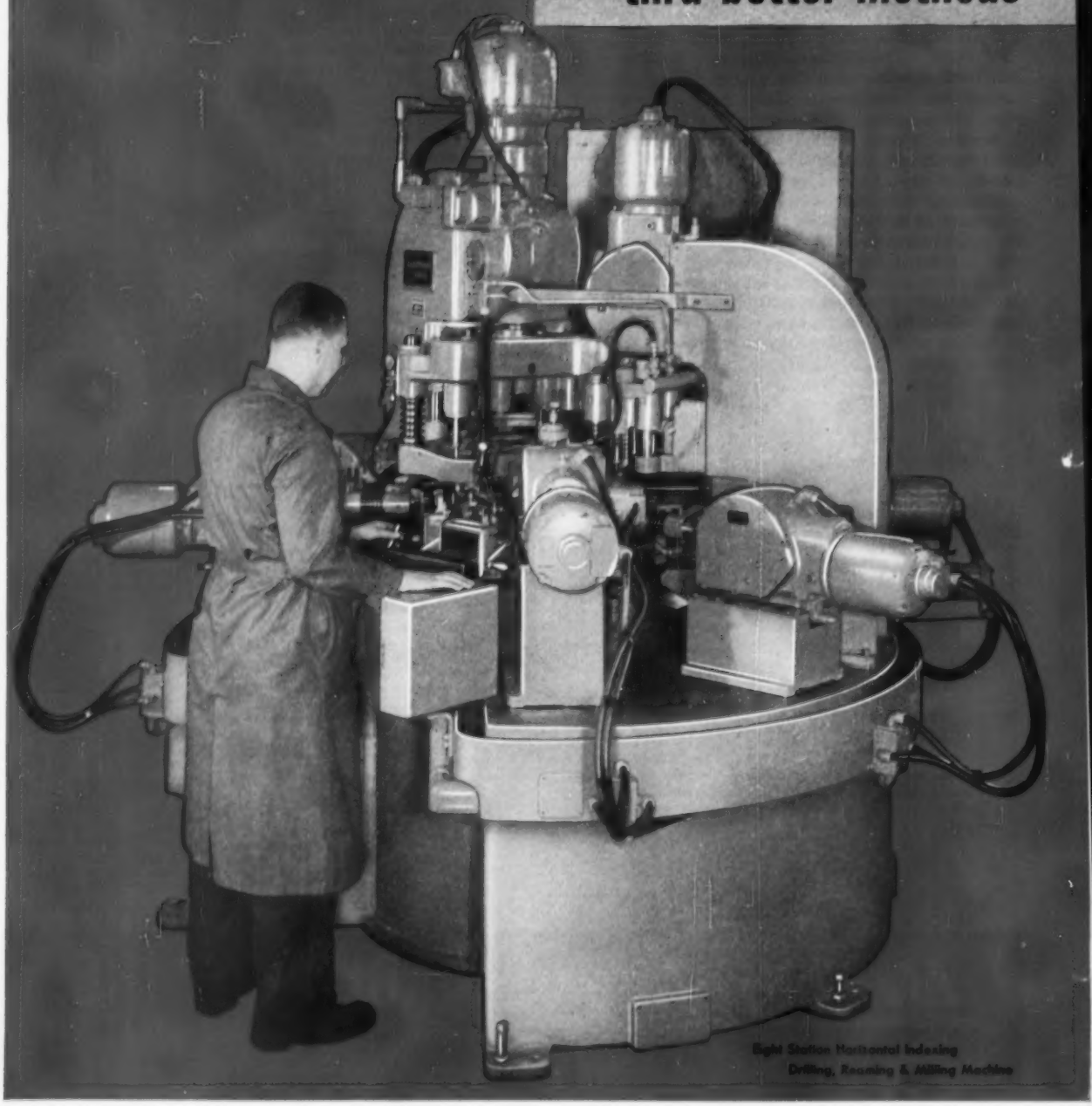
# OFFERS
## better products at lower cost thru better methods

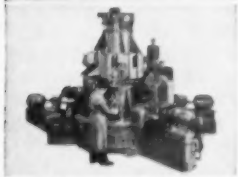


Eight Station Horizontal Indexing
Drilling, Reaming & Milling Machine

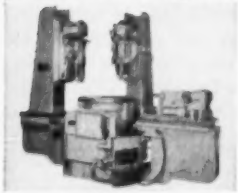
# ONE SOURCE FOR BOTH

## Automatic Production Machines

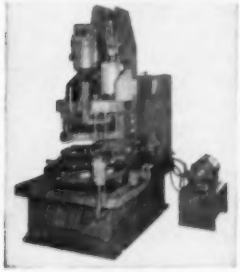
Double End Trunnion Type Machine



Center Column Indexing Type Machine

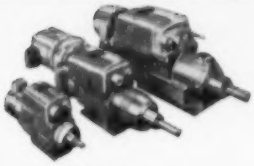


Universal Drilling Machine for jet aircraft components



Vertical Single Unit Multiple Spindle Indexing Machine

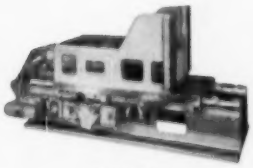
## Standard Machine Components



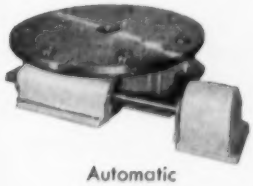
Quill Type Air Hydraulic Drill Units

Quill Type Cam Units

Quill Type Lead Screw Tapping Units



Way Type Hydraulic Feed Units



Automatic Index Tables Horizontal and Vertical

Machine Bases

Designing and building automatic production machines like those illustrated are a "Hartford" specialty. Years of experience have proven that dependable high production and economy can best be brought to the user by means of standard machine components.

Now Hartford Special offers these production tested components to users for machines of their own construction.

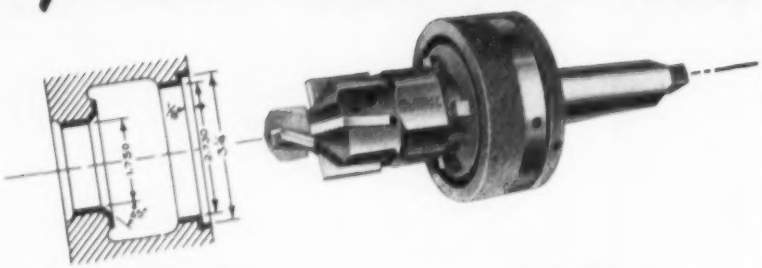
***Consult Hartford engineers for either—completely tooled machines or components.***

**HARTFORD Special**

**MACHINE TOOL DIVISION**
**THE HARTFORD SPECIAL MACHINERY CO.**
**2829 HOMESTEAD AVE., HARTFORD 12, CONN.**

Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.

# Cut Costs WITH McCROSKY COST CUTTING TOOLS Special PRODUCTION TOOLS



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• Engineered specially to your work prints, McCrosky "Specials" combine related facing, boring, counter-boring and chamfering operations — perform them all simultaneously. This assures absolute concentricity and uniformity of finished pieces — eliminates stock-piling and re-handling between operations — speeds up production — reduces the amount of work in process — shortens deliveries — and produces other economies so great that they pay their way even on moderately short runs. Send your work prints to McCrosky, and write for a "Specials" bulletin. It gives complete details; illustrates nearly 50 typical examples.

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Gentlemen:
Please send Bulletins describing the tools checked below.

☐ Jack-Lock® MILLING CUTTERS
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☐ Wizard® QUICK-CHANGE CHUCKS
☐ Specially Engineered MULTIPLE PRODUCTION TOOLS

Name _____ Title _____
Company _____
Address _____


fit to allow his workers time in which to benefit themselves, and some deliberately ignore the interest of the shop as a whole.

Harrison Mitchell
*Topeka, Kan*

### WORKING THROUGH THE BREAK

THE MANAGEMENT of an organization is there for a definite purpose and goal. They must of necessity draw limit lines for the allowable variations in human conduct as well as quality limits for that which they produce. The prior function is usually the more difficult one, for there are no limit stops or adjusting screws to control the variations in human behavior. When a produced part falls outside the acceptable limits it must be discarded or reworked; so too with the employees. A man who does not conform to the rules, both written and un-written, and the established standards, must be corrected if possible and discharged if necessary. In general, men learn these standards of behavior just as they learn standards of shop practice.

The man who does not take the regularly scheduled rest period is a non-conformer and constitutes a potential threat to the peace and harmony of the shop.

The solution to this problem can best be determined by an analysis of the possible reasons why an employee would work through his rest period. Basically, people do not like work. They want and seek work, but it is not the work itself which is desired, only the remuneration or purchasing power that they receive as a result of the work. The employees do not ask to work after hours or on their holidays for the pleasure of it, and if they are asked to come in

*"I was dumping a box and it pulled me in."*

and work, they expect and get bonus pay or time and one-half.

There is no basis for suspecting that this fellow works through his rest period because he likes work. The most likely reason is that he hopes to enhance his position by this demonstration of enthusiasm and ambition. In a very small shop an employee might gain favor with his employer by using this method. In any shop except a small one such action is frowned upon by foreman and supervisors, and even the employer. While it is true that this man will turn out a little extra work by working through his rest period, the work produced is not worth the trouble and confusion it can cause.

The best procedure in this case is for the foreman or supervisor to explain to the employee that the technique he has adopted for improving his position is actually having an adverse effect on his rating. He should be shown how a radical attitude will cause the men to dislike him and to refuse to cooperate with him. He can be praised for his interest and enthusiasm but it should be pointed out to him that the company attaches more value to cooperation and conformity to the established procedure than to the extra work he produces during the rest period.

Sing Yen
*Brooklyn, NY*

## WORKING THROUGH THE BREAK

A MAN who is sufficiently interested in his work to forego the coffee break has a mind of his own and, because of that, should be given the utmost encouragement by management. Such a man is an individualist and they are more numerous than is commonly supposed. Barrett, however, is an individualist in thought and deed,—that fact makes a whale of a difference. It marks him out as a man of discernment and courage; they are *not* so numerous. In these days of pseudo democracy, which often amounts to stark compulsion, many who are men of independent mind have not the moral courage to put their thoughts into action.

All honor to the Barretts in industry; they make their own decisions and have guts enough to translate those decisions into action. They are the salt of the earth and no self-respecting foreman or manager would dream of throwing them to the wolves. Any dead fish can float with the stream; it takes a real, live, courageous swimmer to breast the current. Every sane and fair-minded employer and manager


# SHELDON Precision LATHES
## for the size Lathes
## You Need Most

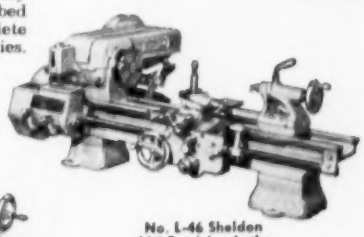
**Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13"... in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.**

**Powerful, all-V-belt, drive units – either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.**

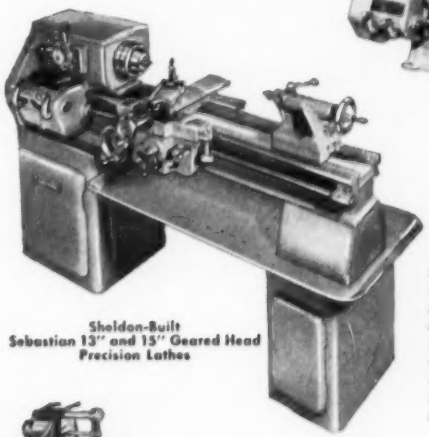
**All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).**

**Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.**

**UM-56 P 13" Swing Precision Lathe**



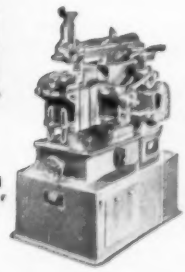
**No. L-46 Sheldon 10" Precision Lathe**



**Sheldon-Built Sebastian 13" and 15" Geared Head Precision Lathes**

**The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.**

**SHELDON Horizontal Milling Machine**



**SHELDON 12" Shaper**

**Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.**

**SHELDON MACHINE CO., INC.**
**4234 North Knox Avenue, Chicago 41, Illinois**

**Gentlemen: Please send new catalogs describing:**

☐ Sheldon ☐ 10", ☐ 11" ☐ 13" Lathes
☐ Sebastian 13" and 15" Geared Head Lathes
☐ Horizontal Milling Machine ☐ Name of Local Dealer
☐ Sheldon 12" Shaper ☐ Have representative Call

Name ..... Title .....
Company Name .....
Street Address ..... ☐ Company ☐ Home
City ..... State .....

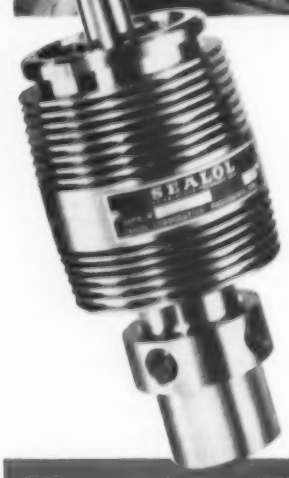
**SHELDON MACHINE CO., INC.**
**4234 N. KNOX AVE. • CHICAGO 41, ILLINOIS**

# Now DRILL PRECISION HOLES IN 1 PASS

ON YOUR DRILL PRESS OR LATHE

with Sealol's

# FLUIDRILL ADAPTOR




**Whether you drill deep or shallow** . . . your present drilling equipment is quickly and economically adapted for **precision gun drilling** with Sealol's Fluidrill Adaptor —

***Gun Drilling*** produces **straight** holes with feeds greater than 11 ipm — tolerances held to less than .0005 in. — wall finishes smoother than 8-10 rms . . . **all in one operation!**

***Here's How It Works:*** The Fluidrill Adaptor is designed for direct attachment to vertical or horizontal drilling equipment. It is installed (or removed) in a few minutes.

The Fluidrill Adaptor transfers coolants at rotational speeds to 10,000 rpm . . . at pressures to 1,000 psi.

Regardless of the depth of hole, coolant is delivered right at the cutting edge. Drills always run cool, chips are continuously flushed out.

***Actual Production Records Prove***

- You save money.
- You get longer tool life, fewer rejects, greater output.

***Find Out More*** about Sealol's Fluidrill Adaptor . . . how easy it is to install, how it can improve drilling performance in your shop. Send for Bulletin No. 12.

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*Mail This Coupon Now*

DEPT. H, WARWICK INDUSTRIAL PARK, PROVIDENCE 5, R. I.

Please send me Bulletin No. 12 on Sealol's FLUIDRILL ADAPTORS for use in precision gun drilling.

Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....

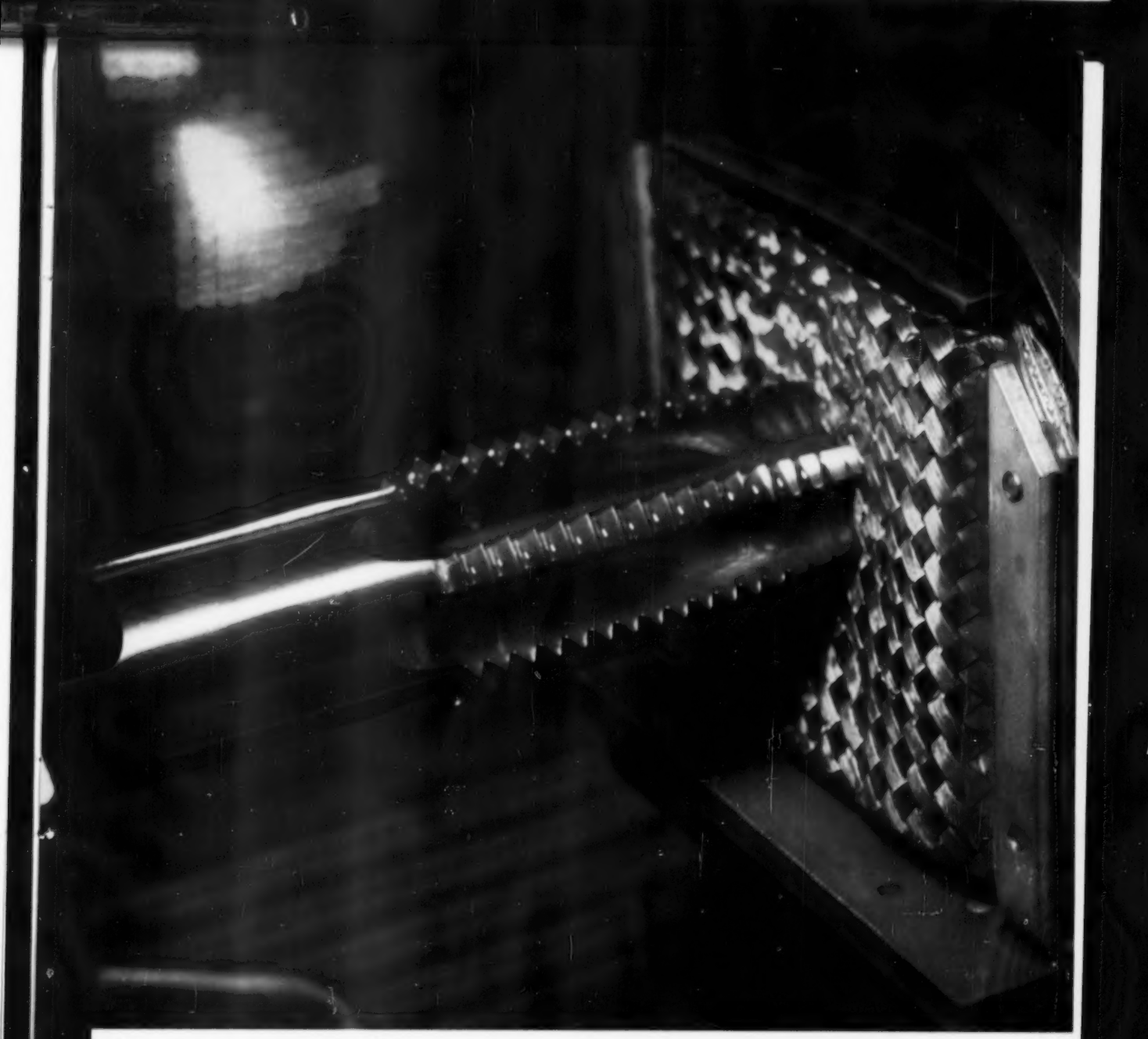

should take his hat off to the man of independent mind with courage enough to face unpopularity for the sake of a principle, undeterred by the verbose spouters who would like to mold creation in their own warped shape.

It should be noted that Barrett finds no fault with those who take the coffee break. The Barretts never ram their opinions down the throats of others. They think for themselves, decide on their line of action, and pursue the even tenor of their ways, indifferent to the clamor of the would-be molders of other people's minds. One sometimes wonders if mass-production methods induce the mass-mind phenomenon so often to be met with in industry today. If so, "Barrettism" is an excellent antidote; its growth and spread should be enthusiastically fostered and should be a number one priority with all fair-minded producers, executives and employees alike. Swift, corrective action should be visited on all who attempt to crib, cabin or confine the Barretts in industry.

No, a thousand times no; Al would not be right in asking Barrett to indulge in the coffee break if he prefers to continue working. Al's reason for opposing Barrett's desire to continue working, to ignore the interruption known as the coffee break, is a lame one and is really more of an excuse than a reason. In claiming "It's easier for me to straighten out one man than the whole department" Al ignores the moral issue and that, like all such proposals, amounts to the easy way out. A responsible executive is not supposed to take the easy way out if it is not the best way. Such conduct is quite indefensible, quite beneath the dignity of a responsible foreman.

Al is clearly fencing; he's running

*"—And furthermore, I feel that we should start a plant-wide research program to find out what happened to the old plant-wide research program!"*



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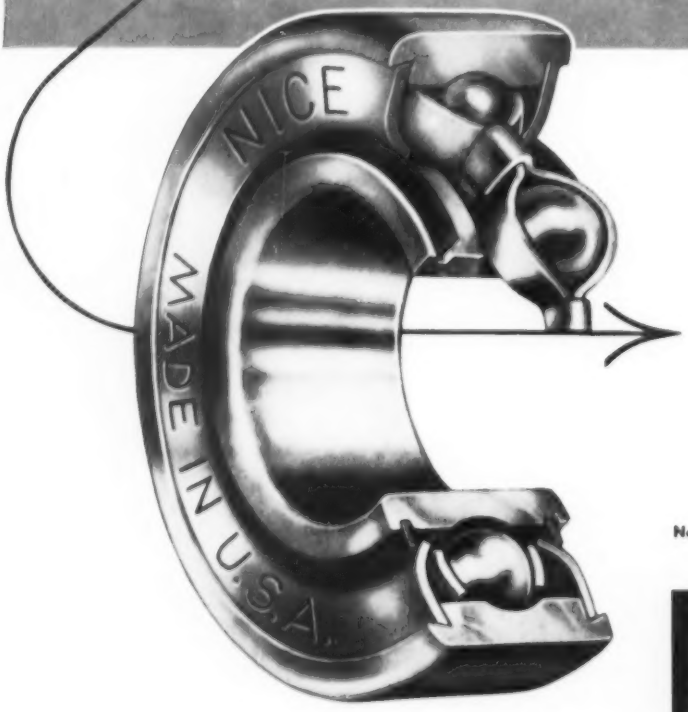


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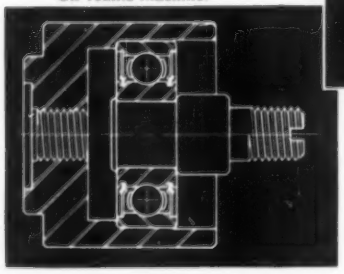

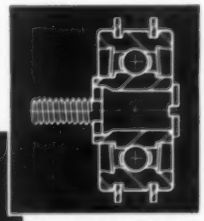

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away from his executive responsibilities. Similar executive fumbling recently caused a flare up in the Glasgow area. Shop stewards in a large plant protested to the shop foreman that an assembly operation was undermanned and asked that an additional man be employed. The foreman pointed out that the matter was one of use and wont, that six men had done the operation in dispute for years and years. The shop stewards insisted and, while the discussion was proceeding on the shop floor, the managing director came along. He asked to be informed on the point at issue and, on hearing the foreman's explanation, astonished him by irritably exclaiming "This job is urgent, nothing must stand in the way of its rapid completion. Put on another half a dozen men, for all I care, but get it out."

An excellent example of backing the wrong horse and denigrating the unfortunate foreman in the eyes of his men, of taking the easy way out and damning the consequences which, in this example, have been considerable. The company is still paying heavily, in terms of shop unrest, due to the cock-a-hoop attitude of the exulting shop stewards, all because of a fumbling managing director who saw only one side of his job and didn't appreciate that a matter of principle was at stake. He was also ignorant of the fact that it was no part of his job to provide an arbitrary settlement off his own bat. This was management in reverse.

Ed has the right way of it. The coffee break is optional and if Barrett feels he does not need or want it, that's his own affair and no one has a right to muscle in and dictate. If friendly persuasion isn't successful, threats to individaul liberty cannot be justified. Such threats belong to the Hitler mentality which so many fought to dethrone.

C Donald
*Lanarkshire, Scotland*

WORKING THROUGH THE BREAK

There always seems to be a few so-called individualists in every plant, and because of the peculiarities and stubbornness associated with human behavior, such individuals want to be different.

When an organization establishes a policy of allowing a coffee break, generally such a policy is not mandatory; however, it is generally expected that the privilege will have complete participation. If there are one or two individuals who fail to participate in the coffee break then


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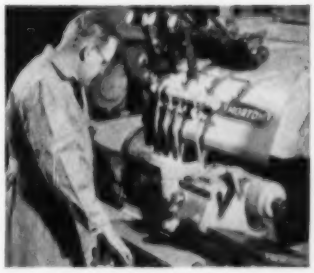

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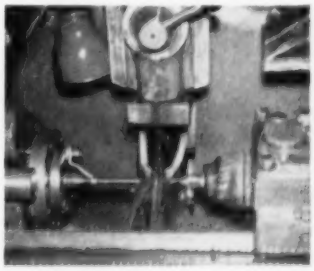

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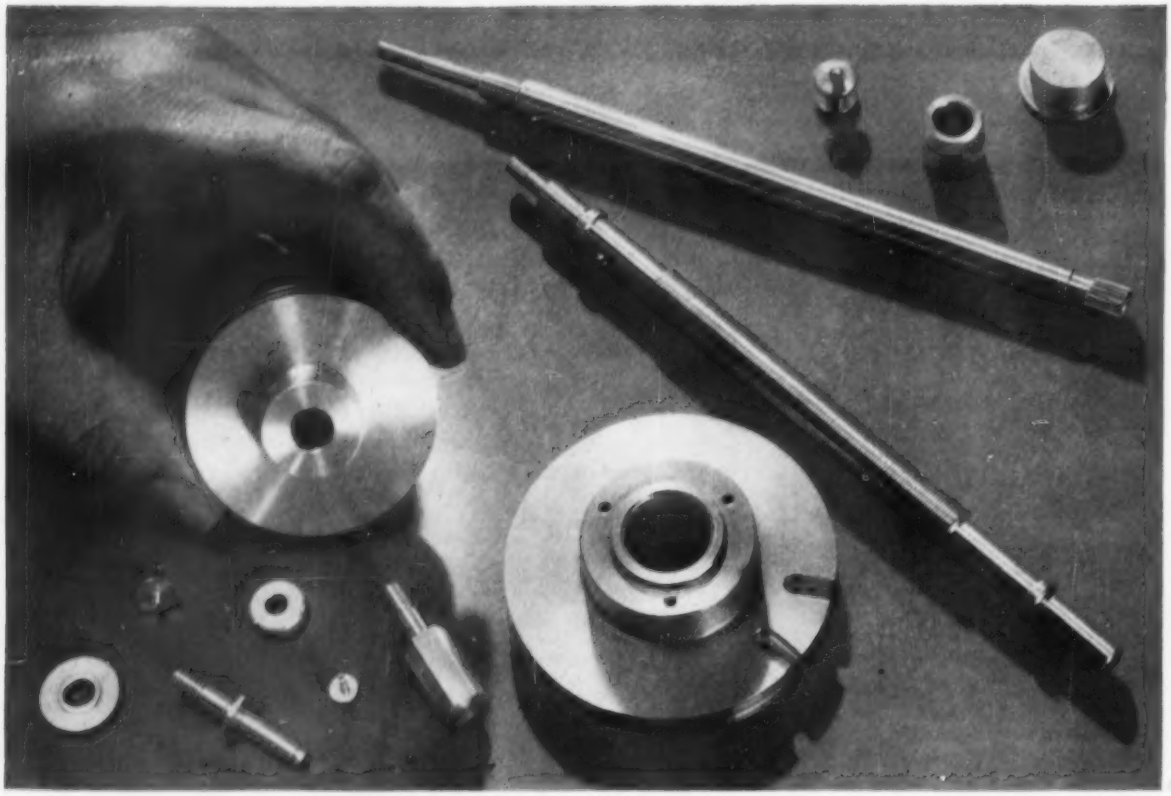


TYPICAL PARTS made of Alcoa Aluminum Screw Machine Stock at Dictaphone Corporation include long, slender feed screws that used to present threading problems in steel. Tolerances of three tenths are not unusual. High stock removal is routine with aluminum.

# HOW DICTAPHONE CORPORATION* DESIGNS FOR SALES WITH ALCOA ALUMINUM SCREW MACHINE STOCK

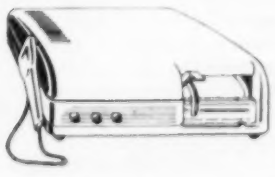
The day the dictating machine left the office and started traveling with the salesmen, surprising things happened. At Dictaphone Corporation, for example, their famous Time-Master dictating machine went on a reducing diet. From 20 pounds, this versatile machine shrank to 12.4 pounds. Aluminum screw machine parts played a major role in making the Time-Master light and portable. But, most important are the other advantages that came to Dictaphone with their switch to Alcoa® Aluminum. "Problem parts" in stainless and mild steel suddenly became routine when Alcoa Aluminum Screw Machine Stock was used. Tool and wheel life increased. Rust problems ended.

While weight reduction may not be the primary consideration for your product, the economic savings and many added advantages of aluminum can solve other problems. Low material costs (three times as many pieces from each pound), excellent machinability, ease of finishing and high resistance to corrosion will make Alcoa Aluminum Screw Machine Stock your choice for non-rusting parts. If you need high heat or electrical conductivity, aluminum has these, too.

These facts practically dictate a hard look at aluminum for the majority of your screw machine parts. To help you take that look, qualified screw machine experts are available at your local Alcoa sales office listed under "Aluminum" in your classified phone book. Aluminum Company of America, 868-J Alcoa Bldg., Pittsburgh 19, Pa.

*

Dictaphone
CORPORATION



Mr. J. S. Decker, Mr. E. J. Kwantz and Mr. J. S. Kemp (left to right) discuss purchase of materials for Dictaphone's new Time-Master.

Mr. T. Chanoux (standing) talks over the design of a Time-Master part with Mr. W. G. Deschenaux.

On-the-job production conference between Mr. S. J. Redmond and Mr. J. A. Gunger.

## IN PURCHASING

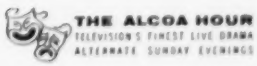
Mr. E. J. Kwantz, Buyer, says, "One reason we do business with Alcoa is because they study our problems and make helpful suggestions. In cases of extremely tough delivery requirements, Alcoa expedites quickly from their mills and warehouses. Availability and quality are big advantages in buying from Alcoa. We find scrap disposal easier with aluminum than with steel."

## IN DESIGN

Mr. Theodore Chanoux, Chief Production Engineer, says, "Five years ago we would have been astounded at what we are doing with aluminum today. In addition to weight savings, aluminum screw machine stock helps us solve other design problems. Acme threads were impossible in stainless parts; they're simple with aluminum. Where we have to specify plating or other special finishes for ferrous parts, simple anodizing of aluminum saves us money. Some of our machined parts are bearing surfaces. Here, too, aluminum performs well."

## IN PRODUCTION

Mr. Matthew Luciani, General Foreman, says, "We can chase an Acme thread on aluminum with two passes compared to six or seven with stainless steel. Tool and wheel life is longer. Lubricants used with aluminum don't get rancid and smelly. Our operators like this, and they like the fact that aluminum chips don't cut them. We make about 80 aluminum parts for the Time-Master at tremendous production savings. We run machines at top speeds and feeds. The parts don't rust in storage."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I believe it would be in order to approach them with the thought in mind that their relationship with fellow-workers would be very much improved. If such employees are endowed with normal intelligence they will generally see the light and fall in line.

There may be reasons for not taking advantage of the coffee break. For an example, there are those who feel that they are creating a good impression with the management staff by working through the break. If this be the case, it should be tactfully discouraged.

Mental unstableness or indifference may be caused or aggravated by occupational maladjustment which manifests itself in abnormal actions such as not taking part in a coffee break. Emotional conflicts resulting from disturbing conditions outside the plant have a marked influence upon the working habits and behavior of individuals. When this is the case, the symptoms and erratic moods of such employees are recognized by fellow-workers who will generally display the tolerance needed to maintain harmony.

In the cases mentioned there isn't very much that a supervisor can do but to recognize the problem and exercise sympathetic guidance. In other words, if they don't want to take the coffee break, leave well enough alone.

Peter L Budwitz
*New Britain, Conn*

*"That's smog, the machine just came in from California."*

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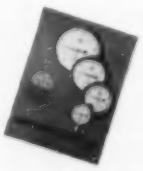

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MECHANICAL PROPERTIES OF WROUGHT PHOSPHOR-BRONZE ALLOYS — *ASTM Special Technical Publication No 183. Published by the American Society for Testing Materials, 1916 Race St, Philadelphia 3. 120 pages, 6 by 9 in. Price, $3.*

Effects of cold-working on the mechanical properties of a series of eight phosphor-bronze alloys are discussed in two conditions in the form of cold-rolled strip with varying tin content from 0.5 to 10%. Electrolytic tough pitch copper strip similarly treated is included to provide a base for evaluating the effectiveness of the tin additions.

The mechanical properties — including tensile strength, proportional limit, yield strength at both 0.01 to 0.2% offset, modulus of elasticity, elongation, bending fatigue characteristics lifetimes ranging from 100,000 to 100,000,000 cycles and the Rockwell Hardness (B and 30 T values)—are reported for six different tempers of each of the materials.

•

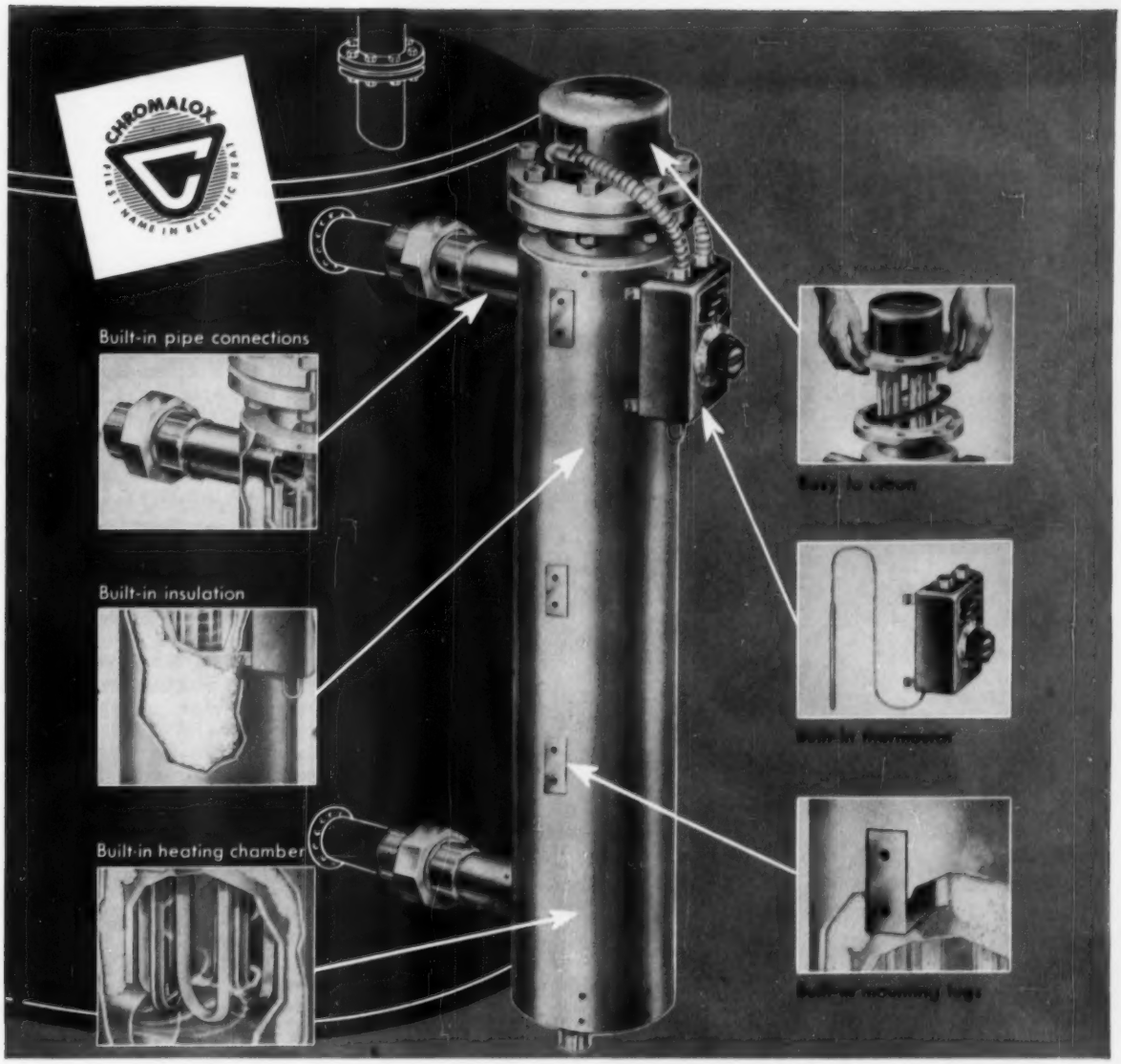
MANAGEMENT FOR TOMORROW—*Published by Chilton Co, Chestnut & 56th St, Philadelphia 39, Pa. 195 pages. Price $6.*

The complete report of the 8th annual conference of the Society for the Advancement of Management includes talks on Control by Incentives, Developing Managers, Opinion Surveys, Internal Audit, Integrated Data Processing, Management and Labor, Productivity, Patterns for the future, and other subjects. Also included are the questions and answers recorded at the conference.

•

THE WELDABILITY OF HIGH-TENSILE STRUCTURAL STEELS—*By C L M Cotterell, K Winterton, and B J Bradstreet. Published by British Welding Research Association, 29 Park Crescent, London W 1, England. 102 pages, 10½ x 8½. Paper bound. Price £1 ($2.85).*

Undertaken on behalf of the Ministry of Supply, this investigation arose from the need to meet urgent government requirements for welding high-strength steels having a higher strength-ratio than that previously considered practicable. It includes examination of existing weldability tests, the concept of crit-

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ical cooling rate, and the development of controlled thermal severity test, and the correlation between weldability and end-of-transformation temperature as determined by continuous cooling dilation tests.

The report is divided into four main sections. Part I deals with the weldability of low-alloy Mn-Mo steel for a special high-strength structure. Part II concerns the weldability and properties of experimental Mn-Ni-Cr-Mo-(V) steels. Part III deals with the mechanism of hard-zone cracking and the assessment of weldability, using physical and mechanical testing, and Part IV is concerned with the influence of hard-zone cracking on the fatigue life of fillet welds.

•

ASTM STANDARDS ON LIGHT METALS AND ALLOYS, CAST AND WROUGHT. THIRD EDITION. — *Sponsored by Committee B-7 of the ASTM. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 276 6x9-in. pages. Price, $3.50 in paper cover.*

This edition includes not only those specifications and methods of test which come under the jurisdiction of Committee B-7, but also those for light-metal-alloy die castings prepared by Committee B-6 on Die Castings, and those for aluminum wire and cable for electrical purposes sponsored by Committee B-1. Several methods under the jurisdiction of Committee E-1 on Methods of Testing and Committee E-3 on Chemical Analysis of Metals as well as specifications for aluminum and aluminum-alloy arc-welding electrodes and for brazing filler metal under the jurisdiction of the AWS-ASTM Joint Committee on Filler Metal have been included to round out the compilation.

The standards include ingots, castings, bars, rods, wire, forgings, pipe and tube, sheet and plate, wrought products for electrical purposes, filler metal, electroplating, and general methods of test. There is also included the ASTM codification system for light metals and alloys.

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MECHANICAL VIBRATIONS (Fourth Edition) — *By J P Den Hartog. Published by McGraw-Hill Book Co, 330 W 42 St, New York 36, NY. 436 pages, 6 x 9 in. Price $9.00.*

In this Fourth Edition, the number of problems has been substantially increased. New material has been

# *Half Mile of Hot Weld Flash Trimmed Per Grind*

HAYNES STELLITE alloy cutting tools trim red hot weld flash from 3200 automobile wheel blanks without chipping, spalling, or losing their sharp cutting edges. The temperature of the weld is at 1500 deg. F as the tools slice through the flash. During the operation, the tools are subjected to thermal shock as they come in contact with the hot metal . . . and to severe impact as they cut through chilled sections and irregular weld surfaces. Yet they remain in operation for a full 8-hour shift.

Three HAYNES STELLITE alloy tools are used on this job. One rough machines the weld and the following two take finishing cuts. They remove 10½ in. of flash from each wheel blank, and trim a half mile of flash per grind.

HAYNES STELLITE tools remove metal fast. They can be used at high speeds with comparatively high feed rates, and they take deep cuts. They have good impact strength, high compressive strength, and retain their hardness at red heat temperatures. This combination of properties makes them extremely valuable on any machining job.

For information on how HAYNES STELLITE tools can help you speed up your machining operations, write for the booklet "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design, grinding procedures, and the machinability of metals.

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

HAYNES TRADE MARK ALLOYS

**HAYNES STELLITE COMPANY**

**A Division of Union Carbide and Carbon Corporation**

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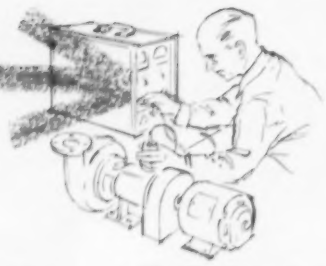
3

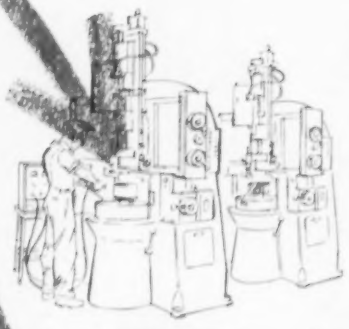


CHECKS MACHINERY OPERATION AND CONDITION — measures permissible vibration and balance tolerances.

WAYS YOUR COMPANY CAN BENEFIT using portable

IRD

vibration analyzers

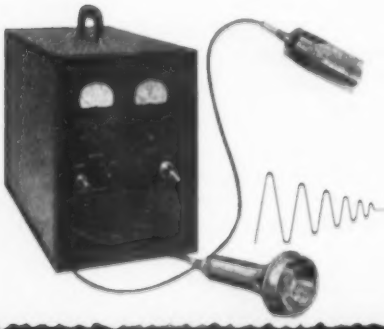


AST TROUBLESHOOTING — quickly inpoints part causing vibration.

No matter what your product or process, IRD vibration analyzing and portable balancing equipment can help you make it better . . . and at less cost.

Hundreds of manufacturers are utilizing IRD vibration analyzing equipment as a fundamental in their plant programs to attain greater production precision, efficiency and quality on machine tools; smoother operation and longer life on pumps, motors, blowers, generators, gyros and all types of rotating equipment.

DYNAMICALLY BALANCES, "IN-PLACE" — without costly tear-down.



Write today for an *in-your-plant* demonstration

Perhaps you have machinery that's operating a bit rough, right now. We'd be happy to have an IRD Sales Engineer demonstrate on your equipment. Just write or phone. No obligation of course.

IRD

vibration analyzers

International Research and Development corp | 802 thomas lane, columbus, ohio

added on Kármán vortices and on non-linear vibrations, with examples of case studies that have appeared in practice since 1947. Changes have been made in each chapter to bring the subject up to date.

The book aims to be as simple as is compatible with a reasonably complete treatment of the subject. Mathematics has not been avoided, but in all cases the mathematical approach used is the simplest one available. The present edition contains 230 problems and emphasizes many applications of principles and calculations to practical vibration problems encountered by the practicing engineer. Complete explanations and proofs are given without use of mathematics higher than differentiations and integrations.

•

Engineering Drawing and Geometry —*By Randolph P Hoelscher and Clifford H Springer. Published by John Wiley & Sons, Inc, New York 16, NY. 500 pages, 8½ x 11½ in. Price $8.*

Text of this book represents definite objectives and philosophy of training in drawing which has been endorsed by leading authorities in the engineering field.

Presentation of material, designed for engineers, is clear in verbal discussion and pictorial illustrations. The book contains the best drafting practices and calls upon the development of reasoning process in its theoretical discussion rather than manual skill. It also adequately covers work in basic drawing, fundamental descriptive geometry, and advanced courses for sophomores in professional fields. Objectives of presentation are to stimulate creative imagination, develop visual perception in three dimensions, and promote original thinking. It is from the viewpoint of the draftsman that the subject matter has been written. Discussions center around such topics as functions of engineering drawing, divisions of engineering drawings, types of projections, professional aspect, standardization of drafting, legal aspects, shop and construction methods, dimensioning, non-projective drawings, computation charts, and value of drawing to the engineer.

The problem sections in each chapter are adequate for at least four semesters of work without repetition. In several chapters, the problems have been presented in a new form so the student must exercise his ingenuity and judgment in the solution.

# High efficiency—low cost

## STANDARD-SIZED ROLLED-THREAD SAGINAW ball/bearing SCREWS

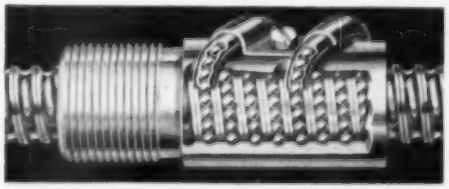
## Provide 4 times more efficiency than conventional screws—and require only 1/4 of the power. Reduce size, weight, cost of entire unit.

Here's great news for every manufacturer who uses Acme screws or hydraulic actuators in his product! Saginaw now offers Rolled-Thread *Saginaw b/b Screws* in standard sizes at amazingly low mass-production cost.

In many applications this new rolled-thread type will provide completely adequate performance at a fraction of the cost of machined-thread units.

**GIVE YOUR PRODUCTS THESE PERFORMANCE ADVANTAGES AT NO INCREASE IN COST—**

- **At least 90% efficiency guaranteed**—compared with 15% to 20% efficiency of Acme screws.
- **Requires less than 1/3 as much torque** as Acme screws for same amount of lineal output.
- **Saves substantially on cost, size and weight** of motors, gear boxes and auxiliary equipment.
- **Far less wear—less maintenance—longer life.**
- **Precision positioning**—free play can be virtually eliminated where necessary.
- **Operates dependably with or without lubrication** at temperatures from −75° F. to +275° F.



New standard Saginaw ball-nut can be furnished threaded or with flange or trunnion-type adaptors for easy application to almost any unit.

**ROLLED-THREAD *SAGINAW b/b SCREWS* ARE NOW AVAILABLE IN THESE STANDARD SIZES AND ANY SCREW LENGTH:**

| Ball Circle Diameter | Ball Size | Lead |
|---|---|---|
| .375 | .0625 | .125 |
| .631 | .125 | .200 |
| 1.000 | .15625 | .250 |
| 1.171 | .28125 | .41304 |
| 1.500 | .34375 | .47368 |
| 2.250 | .375 | .500 |
| 3.000 | .500 | .660 |

**ROLLED-THREAD *SAGINAW b/b SCREWS* ARE ALREADY BEING SUCCESSFULLY USED IN THESE TYPICAL APPLICATIONS:**

- Automatic Garage Doors
- Automobile Seat Adjusters and Window Lifts
- Barber Chairs
- Bumper Jacks
- Circuit Breakers
- Convertible Top Lifts
- Die Table Positioners
- Drill Presses
- Marine Steering Gears
- Welding Machines

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Ball Bearing Screw and Spline Operation, Dept. 7R
General Motors Corporation, Saginaw, Michigan

Please send detailed data on your new Rolled-Thread *Saginaw b/b Screws*. I am interested in their application to:

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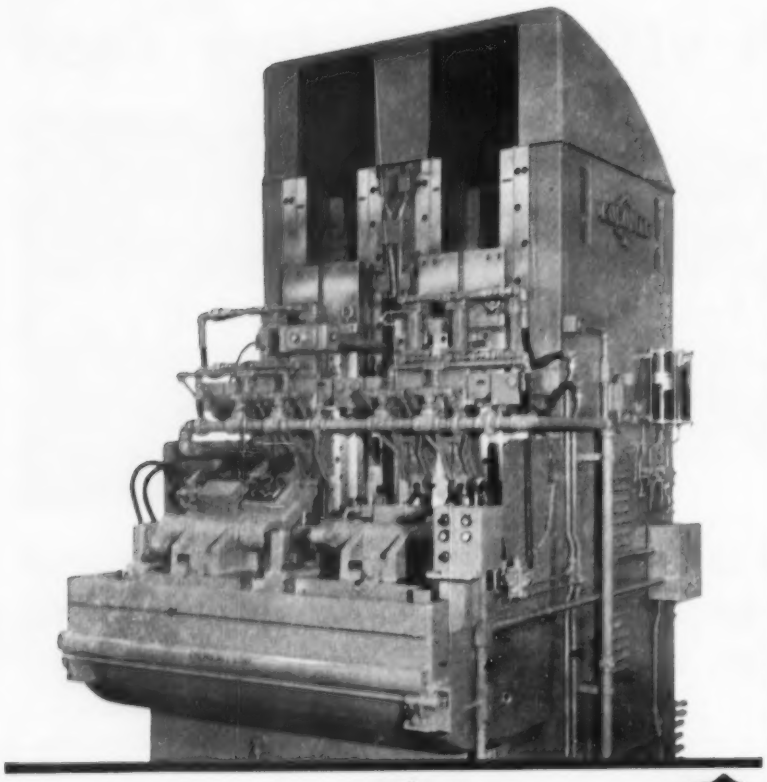
Saginaw ball/bearing Screws and Splines



*Announcing*

**NEW *ElectroGear* DUAL RAM**

*Broaching Machine*

Automotive connecting rods are being broached at a 450 per hour rate on a new Colonial ElectroGear dual ram broaching machine. Finish on broached surfaces is definitely superior—tool life is longer. Cutting speed is 45 feet per minute.

Side by side broaching on each ram (balancing pad and locating pads) produces two completed parts with each cycle of the machine.

New Colonial ElectroGear drive broaching machines are made in dual ram vertical and single ram horizontal models. Your Colonial representative can tell you about the new high in broaching performance that you can get with these machines. Write for information.

COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

## New Films

WORK SIMPLIFICATION ON FILM—*Produced by Industrial Management Society, 35 E Wacker Drive, Chicago 1, Ill.*

A catalog is now available listing 38 motion pictures on work simplification which were award winners in the Society's Annual Methods Improvement Competition. A brief summary of each film is given, together with information on running time and other specifications. Each film constitutes a complete case history on a particular problem, ranging from office work and packaging, to metalworking.

•

ALWAYS ON THE JOB—*Produced by Air Reduction Sales Co, 150 E 42nd St, New York 17, NY. 35 mm, sound, slide film. Running time 20 min. No charge for rental. Purchase Price $15.*

The basic principles of safety in electric arcwelding are well covered in a light cartoon approach. The strip is a companion piece to a similar presentation "The Guy Behind Your Back," which covers oxyacetylene safety.

•

THE SHAPE OF THINGS—*Produced by Allegheny Ludlum Steel Corp, 2020 Oliver Bldg, Pittsburgh 22, Pa. 16mm, sound, color. Running time 16 min. No charge.*

Although designed basically for persons interested in knowing more about the facilities and operations of the company's forging and casting plant, this film also contains a great deal of technical information on forging techniques, special anvil die work, the making of composite die sections, and general and special foundry practice. It depicts the forging and casting of tools and end products at the company's Ferndale, Mich, plant.

•

TRACER CONTROL IN ACTION — *Produced by Gorge Gorton Machine Co, Racine, Wis. 16-mm, sound, color. Running time 36 min. No charge.*

Photographed under actual shop conditions, this picture portrays the

# RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

*Technical-ities*

By John S. Davey

### Selecting the right grade of bolt

With few exceptions, the true function of a bolt is to clamp members together, and not to act as an axle or fulcrum. The residual tension set up in the bolt keeps joints tight.

There's rarely need for costly alloy steel fasteners—not when 3 physical grades of steel can satisfy most "clamping" applications.

SAE grade 1 offers 55,000 psi minimum tensile strength; grade 2, 68,000 psi; and grade 5, approx. 120,000 psi.

The first is used for fasteners which are stress-relief annealed to increase ductility. The next provides low carbon fasteners with a bright finish. The last goes into high-carbon, heat treated black fasteners identifiable by three radial dashes on the head.

#### SOME SUGGESTIONS

In terms of holding power, the stronger bolts and cap screws can cost you less than the cheaper bright ones. For example, either a ⅝" with three radial dashes or a ¾" bright cap screw can be used for a safe working load of 20,000 pounds. But being smaller, the high strength one costs less. However, if the same diameter is desirable, then fewer bolt holes need be made and faster assembly achieved when a product is designed to make use of high strength bolts.

In short, for more pounds of clamping effort per dollar, use high strength fasteners; for more pieces per dollar, use the lesser grades.

# Cold Punched Nuts add to safety factor

NUTS dilate when tightened on a bolt. They also adjust plastically to distribute the load over many threads. Since nuts are overdesigned to be stronger than the bolt, these stresses can be disregarded for all practical purposes.

How a defect in hex bar caused split in nut machined from it.

Drift punch had to distort cold punched nut severely, far beyond its yield point before it cracked.

There are times, however, when nuts with optimum assurance against service failure are desired. In such cases, it pays to consider use of RB&W cold punched nuts.

These nuts are punched at right angles to the metal's flow lines . . . same direction as stress encountered in service. No unrelieved stresses are set up. The initial punching automatically reveals any defects. Repunching, an RB&W development, then not only trues up the hole for clean, concentric threads, but also serves as a drift punch test, automatically checking the soundness of these safest of nuts.

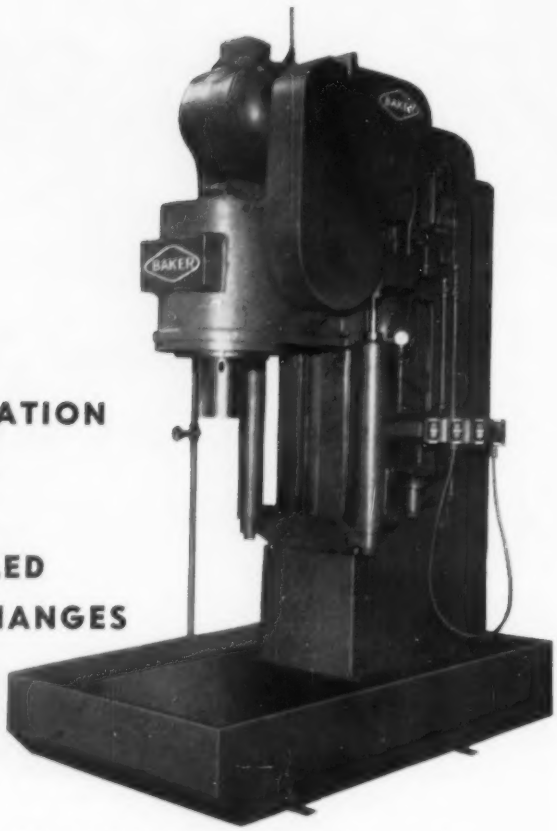
For help in applying standard fasteners to assure more assembly strength and less assembly time, feel free to call in an RB&W man. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore, (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

### One-piece fastener better than two

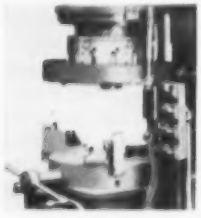
One particular oil filter used to be fastened with stud and cap sleeve made by screw machine. This was only until RB&W pointed out that a one-piece fastener could be formed easily on a cold header. The advantages gained are obvious. The single fastener *cost* less, and took *less time* to assemble.

RB&W makes a tremendous variety of strong, uniform standard fasteners to improve assembled metal products. If any of these don't fill a particular need, perhaps an RB&W "special" can be developed that will.

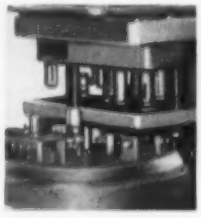


**AUTOMATION THAT'S EASILY RETOOLED FOR CHANGES**

Baker Basic machines don't have to be "rebuilt" when you change your product or methods . . . cost much less than a machine specially designed for only one part . . . and pay for themselves even on lower production runs. Yet they still give you full automation with loading and unloading devices and conveyors . . . which we'll furnish as well as tooling. Use singly or in battery as a transfer machine . . . for drilling, boring, tapping, facing and other machining operations. 5 sizes.



Boring



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ease with which difficult or otherwise impossible milling, profiling, and engraving operations can be performed on the company's tracer-controlled machines. The range of work performed includes the production of the world's smallest engraving, simple two-dimensional engraving, engraving around a cylinder, and machining and grinding on a pantograph.

Manual operation and complete automation within the cutting cycle combine to open new lines of thought for the tool engineer, methods man, and production superintendent.

•

THE LEADING ROLE — *Produced by Formed Steel Tube Institute, 850 Hanna Bldg, Cleveland 15, Ohio. 16-mm, sound black and white. Running time 25 min. No charge.*

Intended for engineering groups, designers, specification writers, production men, and buyers, this film demonstrates the advantages of the tube as a structural form. It shows how welded steel tubing is made, how it serves in everyday life, and its many different uses. As a practical example, the film shows the fabrication of tubing into an automobile rear-axle housing.

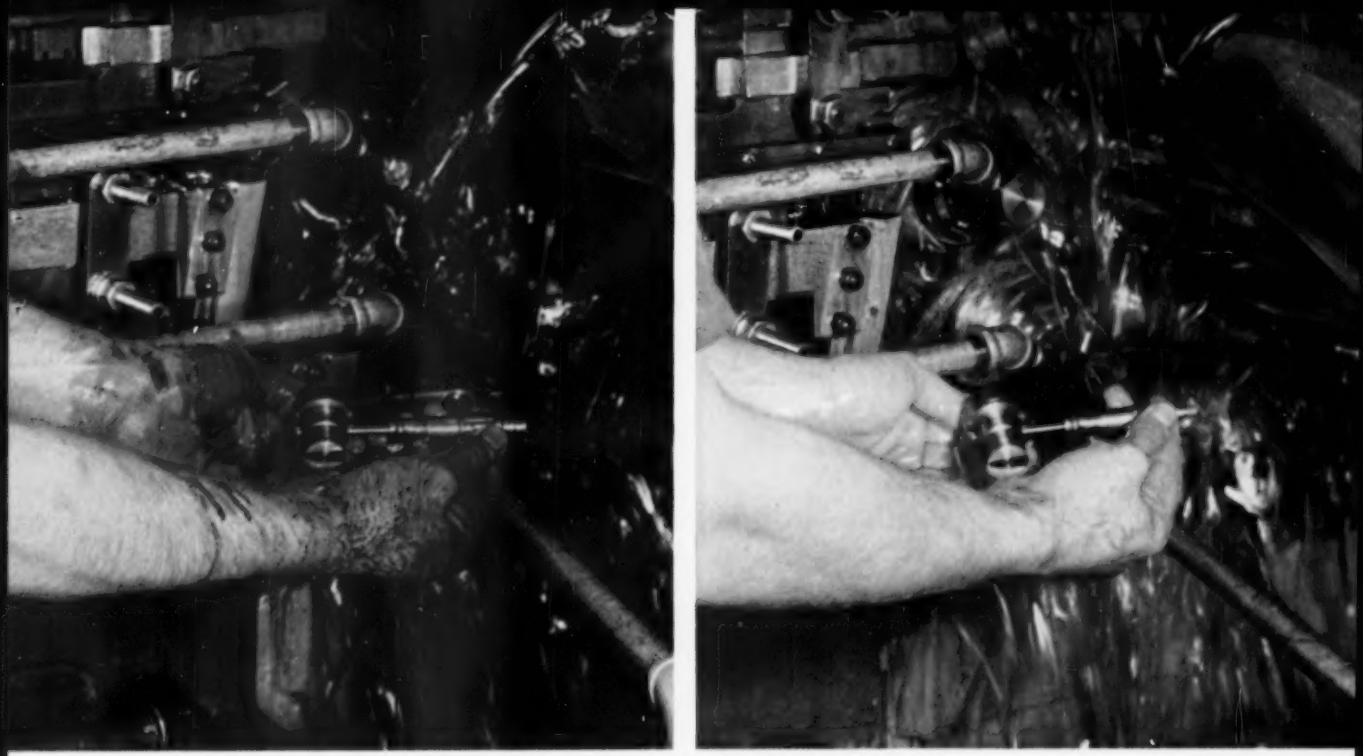
•

CUTTING FLUIDS — *Produced by the Texas Company, 135 E 42nd St, New York 17, NY. 16 mm, sound, color. Running time 19½ min. No charge.*

A brief, clear summary of present-day knowledge of the role of cutting fluids in metalworking practice, this new picture shows how they cut down the harmful effects of heat and friction and how they improve finish, give longer tool life, and permit higher speeds and increased production.

Part 1 deals with cutting oils, and each component is analyzed as to its effect on the heat problem. Particular attention is paid to the role of additives, and rules are given to help the user avoid trouble from straining and corrosion.

Part II concerns water-based cutting fluids and shows how a properly made emulsion can combat heat, bacteria, rust, and cutting pressures. Rules are given for making the emulsion, keeping it clean, and testing to see that it is of the proper strength and composition.



**Black cutting oil** (left) makes close control difficult. Operators dislike dirty operating conditions it creates. Close control is easier and workers are happier with transparent Sunicut cutting oil (right).

# WHY USE A BLACK CUTTING OIL WHEN YOU DON'T NEED IT?

**Sunicut oils give you better visibility without sacrificing machining efficiency.**

When trying to maintain close control over machines producing precision parts, operators can be handicapped by "black-oil blindness". It is hard to see the tools, the workpiece, and the finishes. Checking close tolerances is difficult when the graduations on micrometers and gauges are obscured.

Worse still, as the operator sees it, are the dirty working conditions caused by dark oils. His clothes get saturated with hard-to-remove stains, and his hands are black from one end of the shift to the other.

Transparent Sunicut oils help keep your operators happy and will make close control easier ...and transparent Sunicut oils will do the job with no sacrifice in machining speed or finishes.

To get the full story on Sunicut oils, see your local Sun representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-41.

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*For any machining or grinding operation...*

# THERE'S A SUN OIL THAT'LL GIVE YOU HIGH EFFICIENCY AND LOW OVER-ALL COST

No two machine shops have exactly the same problems when it comes to selecting cutting oils...even when they're running the same job. And, until somebody comes up with the truly universal cutting oil, you can't afford to disregard the importance of oil selection. Here's how Sun can help you.

First, Sun makes a complete line of emulsifying and straight cutting and grinding oils. Second, your Sun representative, backed up by field engineers, has the necessary practical experience to recommend the oil that will give you both high machining efficiency and low over-all costs.

For the full story about Sun's cutting oils, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-42.

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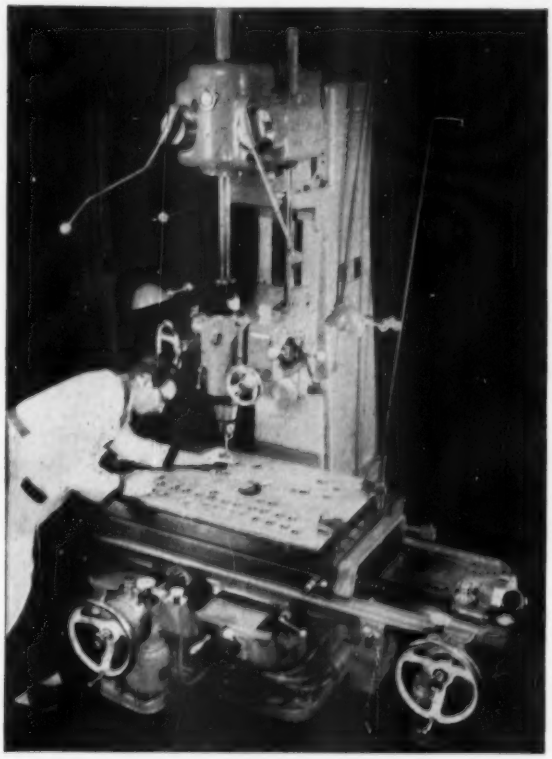
# BUY Precision THAT FITS...!

for tenths
**YOU NEED A**
**CLEEREMAN JIG BORER**

*OR*

for .001"/foot
**YOU NEED A**
**LAYOUT DRILLING MACHINE**



If your work involves gages, jigs, fixtures, or "jigless" production with ultra-fine tolerances, one of the three models of Cleereman Jig Borers is the answer.

But when your work calls for tolerances of .001" per foot, the economy of the Layout Drilling Machine is the "common sense" approach to your problem.

**There are installations near you. Your Cleereman distributor can answer your questions and arrange an inspection visit for you.**

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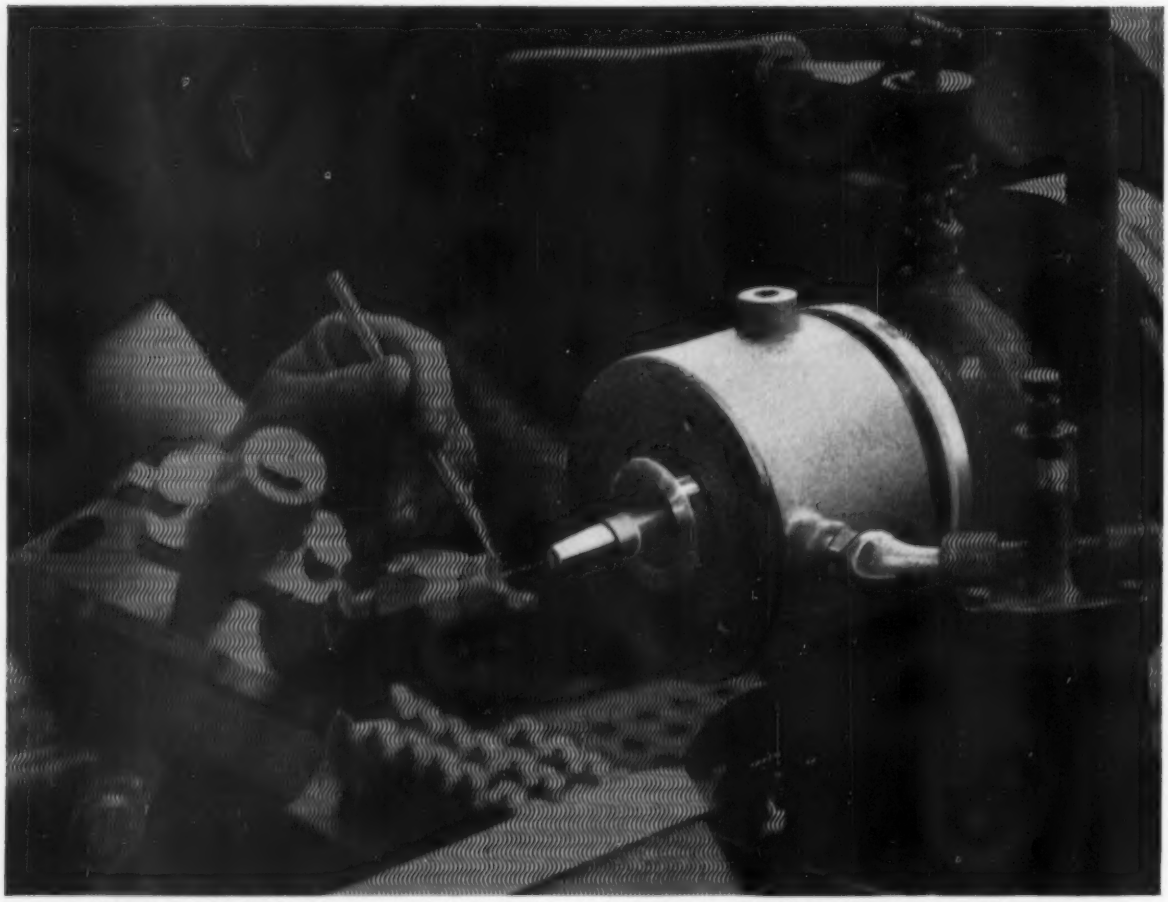

Photo: *Courtesy Harris Calorific Company, Cleveland, oldest and largest independent producer of gas welding and cutting equipment in the country.*

# ERICKSON AIR CHUCKS

## a hot tip for cutting costs on cutting-torch tips

*Erickson '09 Model Air Chuck for heavy work. Quick-acting air chuck, with leverage principle, gives 3 to 4 times holding power of ordinary chucks.*

**Bothered by a tough holding problem? Then let us show you how Erickson holding tools speed production, lower costs. Call us or write for Catalog K.**

"We have used Erickson Chucks since 1942 . . . and would recommend Ericksons to any plant which wants to increase production . . ." That is the report from Harris Calorific Company, big-name manufacturer of gas cutting and welding equipment.

The company uses four No. 400 Erickson Air Chucks for finishing leaded copper cutting-torch tips. Operations consist of drilling, reaming and polishing—at the rate of approximately *100 pieces per hour per chuck*.

Compared to previous methods, Harris Calorific Company claims, trueing-up time has been cut 70% . . . chucking time 60% . . . set-up time 25%.

Let an Erickson representative show you how to cut your production costs—*accurately*—with Erickson Air Chucks.

AA-37119

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| COLLET CHUCKS | AIR-OPERATED CHUCKS |
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# P&H Welding Positioners give you

# EXTRA CAPACITY

## *for BIGGER PRODUCTION SAVINGS*

**Exclusive P&H design features permit handling greater positioning loads for every dollar you invest**

*Positioned* welding is *downhand* welding that permits your weldors to use larger, hotter rods for higher deposition rates. This extra welding speed and the savings in handling of weldments cut welding costs as much as 50%.

When economies like this are possible, it pays to get P&H positioners. Size for size, they can handle the widest range of weldments — give you the greatest capacity per dollar invested. The chart below compares the load capacities of positioners in the 3000-lb. class and proves the extra value of P&H.

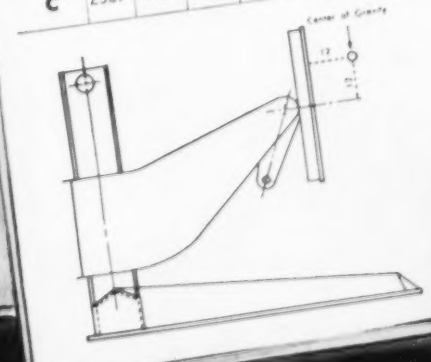
This extra-capacity advantage is found in all sizes of P&H positioners. A free load-capacity table is available to help you select the model best suited to your needs. Just send in the coupon.

**HARNISCHFEGER**
MILWAUKEE 46, WISCONSIN

**3000-LB. MODELS**
**LOAD CAPACITY COMPARISON CHART**

Capacity Shown Below at 12" off center of Rotation and Distances of Center of Gravity of Load from Table.

| Positioner | 12" | 18" | 24" | 30" | 36" | 42" | 48" | 54" | 60" |
|---|---|---|---|---|---|---|---|---|---|
| **P&H** | **3000** | **2510** | **2160** | **1900** | **1690** | **1520** | **1390** | **1270** | **1180** |
| A | 3000 | 2000 | 1500 | 1200 | 1000 | — | — | — | — |
| B | 3000 | 2250 | 1800 | 1500 | — | — | — | — | — |
| C | 2987 | 2187 | 1725 | 1424 | 1212 | 1056 | 935 | 839 | 760 |



*I'M SMOOTHARC SCOTTY...and I'm always looking for ways to save money. That's why I like the extra capacity of P&H positioners. Our FREE load-capacity table will show you why.*

SEND COUPON TODAY FOR **FREE** INFORMATION

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Attention: W. R. Stephens, Sales Manager

Please send me your free load-capacity table covering the P&H Positioner line.

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Company _____

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3090

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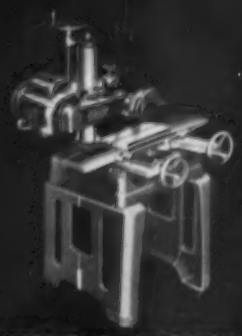
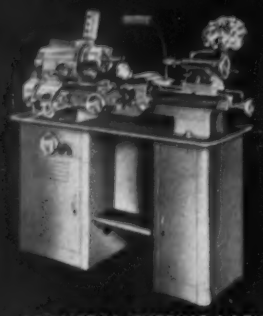
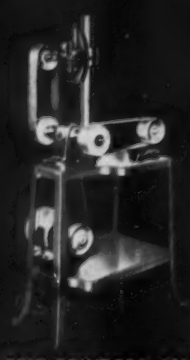


GRINDERS: Toolmaker Grinder, Standard Surface Grinder, Chip-Breaker Grinder, Tool & Cutter Grinder



11" METAL CUTTING LATHES:
Five-foot Bed, Four-foot Bed



BELT GRINDERS: 2½"

BAND SAWS: 14",
8-Speed Metal-Wood

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## For Woodworking

SHAPER:
Industrial and Bench

CIRCULAR SAWS:
12", 10" Tilting Arbor, 10" T.A. Bench

BAND SAWS:
20", 14"

RADIAL SAWS:
20", 14", 10", 9"

JOINTERS:
8", 6" Long Bed

SCROLL SAW: 24"

PLANER: 13" x 5"

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**World's most complete, most versatile, most useful line of metalworking and woodworking power tools**

**53 Machines...246 Models...Over 1300 Accessories**

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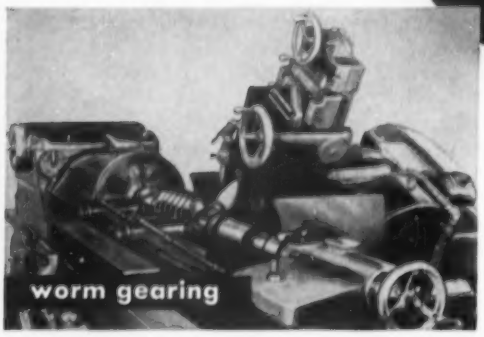
# WORM GEARING

## by "Phillie Gear" assures you accuracy... efficiency ...dependability




Worm grinding is an operation which is essential to successful worm gear operation... When worms are heat-treated for maximum surface hardness, the hardening process often produces changes in the lead angle and tooth profile, and always leaves a rough scaly surface on the threads. Worm thread grinding will correct errors of lead and profile, and produce a mirror-smooth surface finish, which is highly important to worm gear tooth action. Philadelphia worms up to 12" pitch diameter, 1 diametral pitch, are thread ground on our modern equipment.

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Any Worm Gearing, is, of course, only as good as the knowledge and equipment of its maker, plus the quality of alloys and methods used in making both Worm and Worm gear—This is where "Phillie Gear" is really tops.

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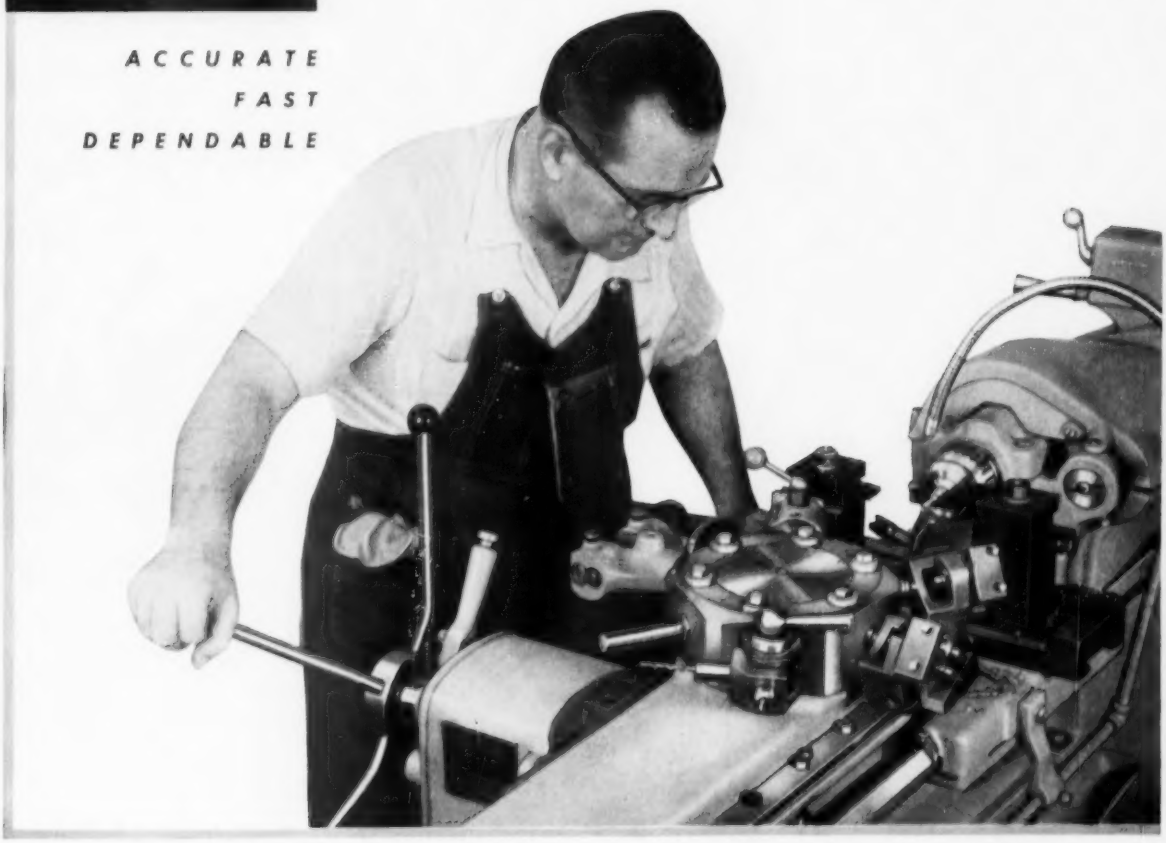
# New 13" PRECISION TURRET LATHE

ACCURATE
FAST
DEPENDABLE



### HARDENED BED WAYS

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The production of small parts requiring both exacting tolerances and high output calls for this new turret lathe. In it has been combined machining speed, handling ease, accuracy and rigidity for utmost efficiency on every job.

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Send for complete information if you are interested in producing more precision parts at lower costs.

**SPECIFICATIONS:** Swing 13⅛" • Collet capacity 1" • Spindle bore 1⅜" • Turret ram effective feed 6½" • Turning feeds 48 • Facing feeds 48 • Threading feeds 48 • Turret feeds 144 • Spindle speeds 12 • **Prices start at $2,344.**

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SOUTH BEND
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**SOUTH BEND LATHE, South Bend 22, Indiana**

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**South Bend Lathe, South Bend 22, Indiana:** Send information on 10", 13" and 16" Turret Lathes, —Engine and Toolroom Lathes, —Milling Machines, —Shapers, —Drill Presses, —Pedestal Grinders.

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**SKIL Heavy-duty ¼" Drill, Model 75**

Boosts production, cuts costs! Top operating power . . . lighter weight, longer life, lowest maintenance. Capacities: ¼" in steel, ½" in wood. Choice of 7 speeds, 500 to 5000 r.p.m. . . . to meet your needs.

**SKIL ½" Drill, Model 80**

Lightweight and compact design make this powerful ½" SKIL Drill a favorite for general drilling and boring. Helical gears give quiet, dependable power. Ideal for maintenance and many production jobs.

**THERE ARE 20 SKIL MODELS FOR EVERY DRILLING JOB!**

# New SKIL 1/4" Drill Value...

## Up to 40% More Powerful Than Other Drills in its Price Range!

### Faster, easier, more accurate drilling —in maintenance and production

Only SKIL offers a ¼" drill value like this! Although the new Model 134 is up to 40% more powerful than other drills in its price range, its light weight and new pistol-grip design make it easier to handle! Speeds through tough hard-to-reach metal or wood drilling assignments . . . in maintenance, on the assembly line, or in the shop.

New revolutionary *dura-plastic* finish gives sure grip, resists wear. Quality SKIL features assure long life under rugged use. Put the new SKIL Model 134 on your production or maintenance team at the low price of only $34.50! See it, try it, today!

**SKIL Standard-Duty ¼" Drill, Model 134**

**Only $34.50**

**Standard speed—1800 r.p.m.**
**Capacity in steel, ¼"; in wood, ½"**
**Net weight, only 3¼ lbs.**

### Advantages You'll Find Only in a SKIL Drill at this Low Price!

- **New dura-plastic finish** for easier, more positive grip. Tough, chip-resistant, stays clean longer.
- **Quality geared chuck** for fast, accurate bit changing. Remains accurate throughout life of drill.
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- **Large inspection plate** for easy routine maintenance. Other famous SKIL Drill features!

***FREE DEMONSTRATION AND FREE TRIAL!***
**See how SKIL gives you more drill for your money! Send coupon today!**

SKIL PORTABLE TOOLS

Made only by SKIL Corporation, formerly SKILSAW, Inc.
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***When You Buy A Drill, Be Sure It's A SKIL!***

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# ERRINGTON TAPPERS . . .
## *the* COMPLETE LINE . . .
## *the* LEADING LINE SINCE 1891

**FRICTION**
For blind holes, tapping in steel, copper, etc. wherever there is danger of breaking taps.

**Errington specializes in the manufacture of high speed multiple drilling and tapping attachments. The name Errington is your assurance of top-quality products . . . your assurance of the finest and most modern tools to produce first-grade workmanship at minimum operating costs.**

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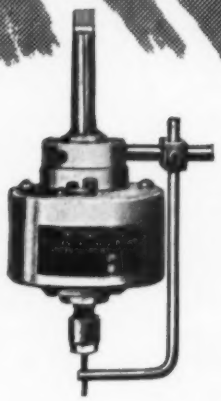
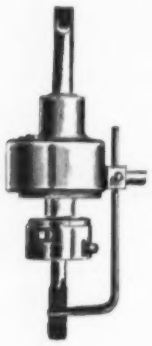
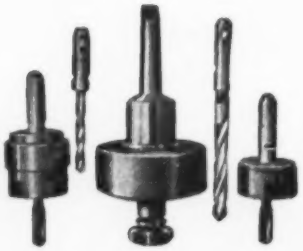


**BALL BEARING CONE-DRIVE**
Designed for Ball Bearing High Speed Drill Press.



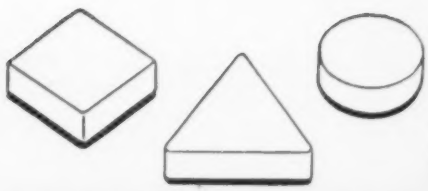
**POSITIVE**
For through holes where work is drilled and then re-handled and tapped.



**QUICK-CHANGE**
Tool-Holders to Drill, Tap and Set Studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder, if required.

***These Tappers may also be adapted for button or acorn die threading.***

**ERRINGTON MECHANICAL LABORATORY, Inc.**
*Established 1891*
*Main Office and Plant:* **STATEN ISLAND 4, NEW YORK**



# CARMET

## CA-610 THROW-AWAY TOOL BLANKS

## improved this cutting operation

# 150%

**Write for the NEW CARMET CATALOG**

. . . Completely revised, the 16th Edition of the Carmet Catalog contains the latest information on all Carmet grades, and on Carmet blanks, tools, die sections, etc.; also gives details on special preforming and how to order special parts.

**Address Dept. AM-8**

A leading West Coast manufacturer now uses Carmet CA-610 tool blanks for machining components of jet engines and gas turbines. Since switching to this special steel-cutting carbide grade, production has sharply increased from 28 parts per blank *to more than 80.*

Carmet throw-away blanks are designed for any type of tool holder. This same manufacturer reports that the ease and speed with which used blanks may be exchanged for new ones has reduced downtime for tool change-over by 7%.

Advantages such as these are important in *your* industry, too. Call your Carmet dealer TODAY for his advice on any production problems you may have . . . or write *Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Mich.*

For ALL your CARBIDE needs, call

# Allegheny Ludlum

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AL® CARMET CARBIDES

# *Maytag switches to* STANICOOL HD *Soluble Oil... makes two-way saving*

## 1 *Cost of soluble oil reduced*

## 2 *Soluble oil consumption cut two-thirds*

A 300 ton Verson press at the Maytag plant, Newton, Iowa, is used for piercing holes in the inner tubs of Maytag's fine automatic washers. Material used is 18 gauge enameling iron. Holes are pierced in six automatic cycles. A total of 936—$\frac{3}{16}$ inch holes and 6—$\frac{19}{32}$ inch holes are incised in each tub.

**A check of manufacturing costs** on the tubs disclosed that the cost of soluble oil per unit produced was too high. Standard Oil lubrication specialist J. I. Nelson, working with plant management, suggested a switch to STANICOOL HD Soluble Oil. The switch was made and Maytag received the first part of its two-way saving: the cost of soluble oil per gallon was reduced. Then it was found that the same high quality product could be turned out, without loss of tool life, while spraying only every third tub. Formerly *each* tub was sprayed with soluble oil before punching. With STANICOOL HD, Soluble Oil consumption was reduced two-thirds. And thus, Maytag received part two of its two-way saving.

**Perhaps STANICOOL HD Soluble Oil** can help you make similar savings. Find out more about this quality soluble oil. Call your nearby Standard Oil office. There is one near you in any of the Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Maytag, leader in cutting laundry time for modern homemakers, knows how to cut manufacturing costs, uses STANICOOL HD.

Dwight Norton (right), a Maytag plant foreman, inspects automatic washer inner tub with Jesse I. Nelson, Standard Oil lubrication specialist. Jesse Nelson is well qualified to provide lubrication technical service. He has a B. S. degree in engineering from the University of Iowa and has completed the Standard Oil Sales Engineering School. Jesse has been helping customers with lubrication problems for more than three years. Customers find his experience and training pay off *for them.*

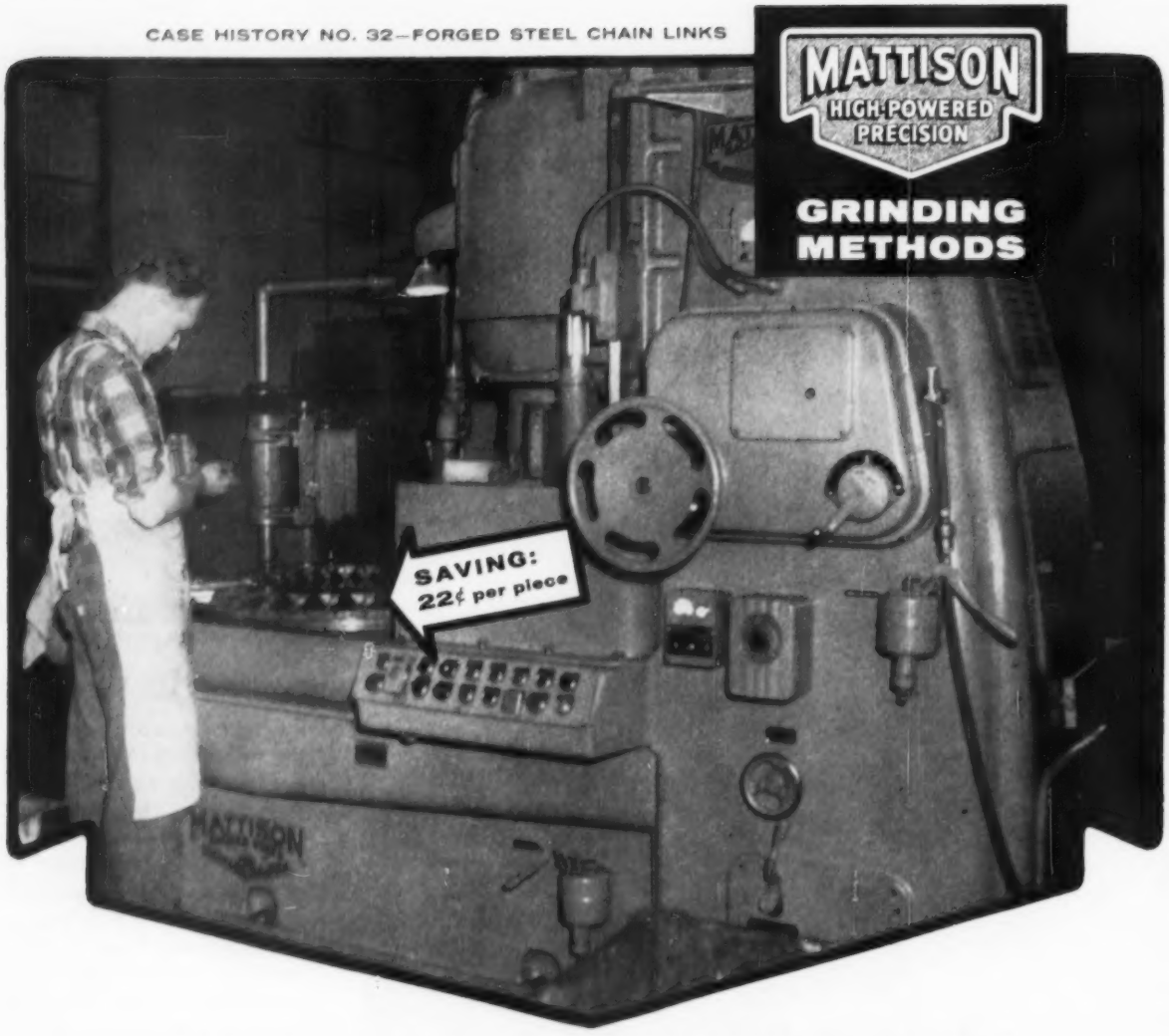
## *Quick facts about* STANICOOL HD Soluble Oil

- Emulsifies readily with all waters.
- Forms stable, uniform emulsion.
- Does not turn rancid.
- Non-injurious to men, machines and work.
- Economical. Meets work requirements with relatively low emulsion concentrations.
- Prevents rusting of work and machines.
- Gives better tool life.
- Doesn't form gum on machines.

STANDARD

**STANDARD OIL COMPANY**
(Indiana)

CASE HISTORY NO. 32—FORGED STEEL CHAIN LINKS

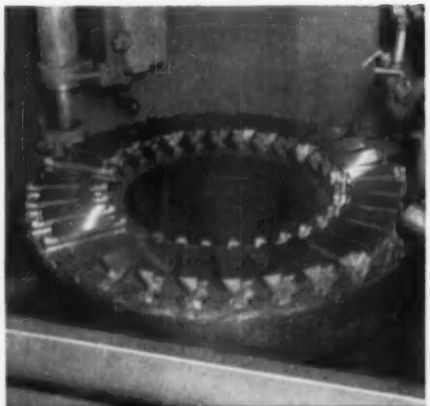



## Change from milling to high-powered surface grinding saves 22¢ per piece!

Formerly, these 4140 drop-forged chain links were milled, 100 pieces every three hours, using high-speed steel cutters. Eighteen pieces were produced between sharpenings. At 35 minutes per sharpening, 3.2 hours of cutter maintenance were required for every three hours production at a labor cost of $16. This, plus machining cost of 15¢ per piece, gave a total cost of 31¢ each.

Today, links are machined, 30 pieces per load, at rate of 100 pieces per hour on the Mattison No. 24 Automatic Cycling Vertical Spindle Surface Grinder, equipped with 40 hp spindle motor Stock removal is .140 in., at .016 in. minimum downfeed per minute. Wheel cost per piece is 4¢, but maintenance cost is eliminated because wheel is self-dressing. With a labor and machine cost of 5¢ per piece, total cost to grind is only 9¢—a saving of more than 22¢ per piece, plus additional savings in cost of cutters.

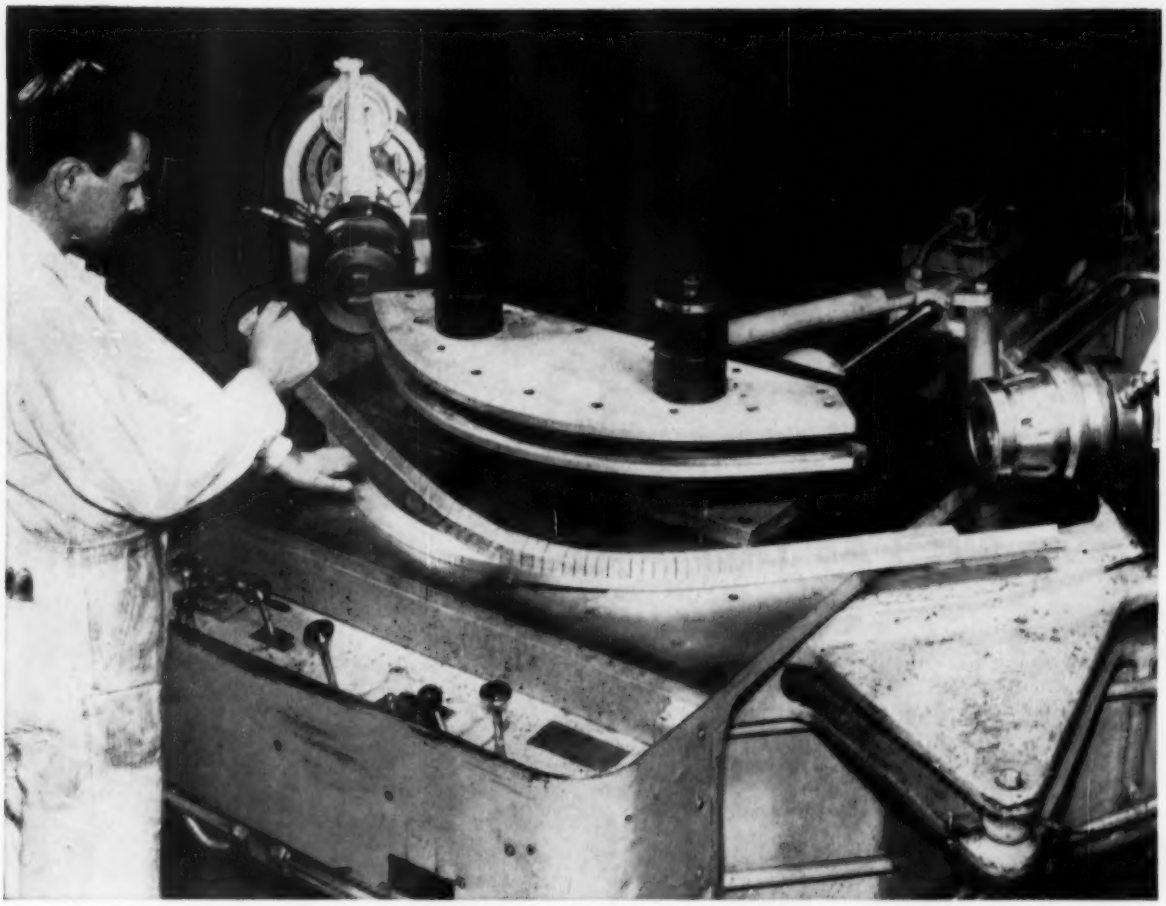
Mattison Vertical Spindle Rotary Surface Grinders offer continuous downfeed and automatic cycling and sizing of work, to machine large or small flat surfaces accurately and fast. Send your parts to the Mattison Methods Laboratory for a sample grind and production estimate.



Automatic sizer gauges parts continuously and stops automatic grinding cycle when finish size is reached.

*Made with MAGNESIUM for better stretch-forming.*

DOW



**TO THE RESCUE!** Magnesium snake and tooling plate stretch-forming die has eliminated a lot of headaches for Hufford Machine Works, Redondo Beach, California. Galling, which causes scratching and excessive wear in stretch-forming aluminum extrusions, is no longer a problem since the company switched to magnesium dies. Something else, too—tool costs were cut 20%!

# NO GALLING PROBLEM HERE!

## Magnesium tooling plate solves this problem in stretch-forming aluminum

**Latest development in stretch-forming** — magnesium tooling plate. The number one reason is that magnesium's fine-grain, porosity-free structure and better slippage reduce galling to practically *nothing*.

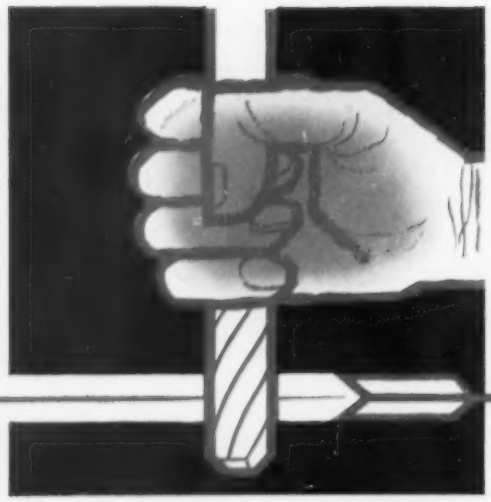
Hufford Machine Works recently substituted dies made of magnesium tooling plate for the steel and aluminum ones they had been previously using. The result: the magnesium dies ran 500 pieces without showing wear and the aluminum extrusions showed no scratch marks!

**There are other advantages** to magnesium tooling plate. Light weight—one-fourth that of steel, one-third less than aluminum—makes magnesium dies much easier to handle and use. Excellent rigidity, strength and dimensional stability are also magnesium characteristics . . . as well as outstanding machinability and weldability.

**Ready availability and lower prices** complete the magnesium tooling plate picture. It's a picture you should look into to solve your own tooling problems! For more information about magnesium tooling plate contact your nearest supplier of Dow magnesium, or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 369BB.

**AVAILABLE FROM STOCK AT:** Copper and Brass Sales, Inc., Detroit, Mich. • Fullerton Steel and Wire Company, Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Company, Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

*you can depend on DOW MAGNESIUM* DOW

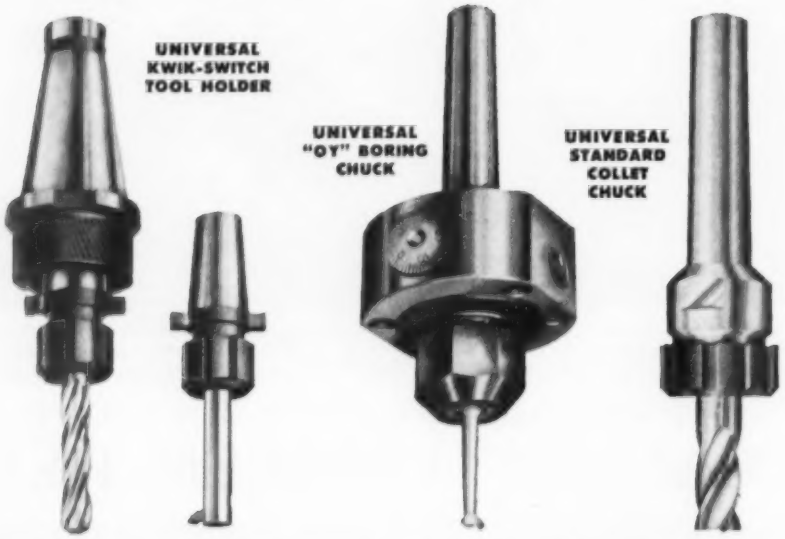


positive
grip

and true-running

tools

## ARE CERTAIN WITH UNIVERSAL CHUCKS SUCH AS THESE:




A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. This positive grip, plus the precision manufacturing of all Universal chucks, keeps tools running true to .001" within an inch from the nose of the chuck. Our simplified chuck design eliminates auxiliary bearings, resulting in low cost to you. Sizes range from 1/16" to 1 1/2", with shanks to fit any machine. For complete information on these three or other Universal chucks, write the office nearest you: Universal Engineering Sales Co., 1060 Broad St., Newark, N. J., 5053 Sixth Ave., Kenosha, Wis., or our home office in Frankenmuth.

**UNIVERSAL ENGINEERING COMPANY**

FRANKENMUTH 1, MICHIGAN

195

carbide NEWS

***Another WESSON development eliminates grinding, makes tool changes quick and easy***

# New Precision Boring Tools Use Throw-Away Carbide Inserts

Micro-adjustable boring tools using "throw-away" carbide inserts are the latest in a series of developments pioneered by Wesson in recent months. Aside from eliminating grinding and speeding tool changing and setup, considerable improvement in performance and lower tool cost per piece are major advantages reported from the development.

### On the Button

Precision adjustment for diameter of cut is positive and simple. It can be made without removing the tool from the machine since the new Wesson boring tools incorporate a calibrated screw adjustment. The circular dial has 25 graduations, each representing .001-inch. Thus each revolution of the screw is equal to moving the tip in or out .025-inch. Accuracy is assured since the head of the adjusting screw is always pulled up and locked positively against a locating face.

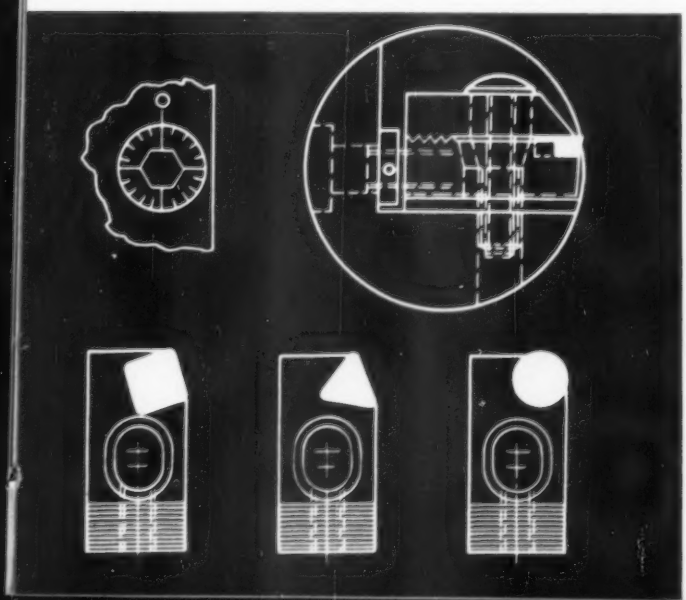
Among striking features is an adjustable built-in chip breaker that also serves as the clamp for the tip.

### Versatility Too

Round, square or triangular inserts can be used with only minor parts changes. All parts of any one size of boring tool are identical except for the tip and the anvil-locator in which the tip is mounted.

The new tools are also suitable for internal (American Standard) threading operations using standard Wesson-metal 60° triangular inserts.

For more information on Wesson's micro-adjustable boring tools, write for Data Sheet 8156, or contact your Wesson tool engineer.



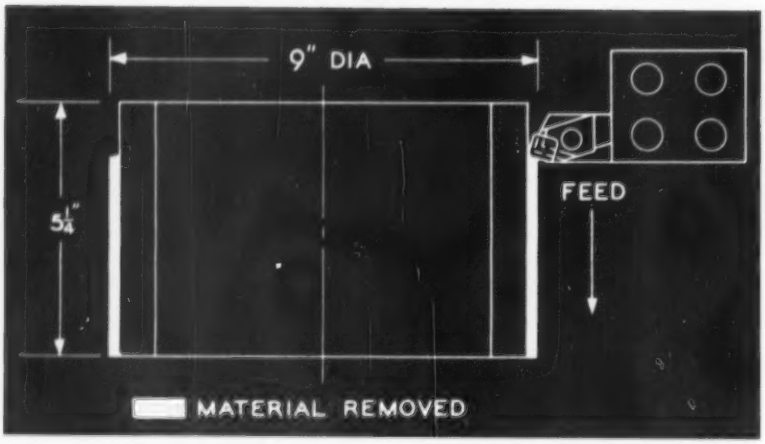
*Calibrated-screw (upper left) enables precision adjustment in size of hole being bored to be made right in the machine. Note standardization of parts for interchangeability.*

# carbide NEWS

## Automation Boosts Demand for Special Tools

While automation tends to increase standardization of products, it works the other way when it comes to the tooling used in automated lines. So much so, in fact, that Wesson Multicut Company is erecting a new plant in Brighton, Michigan, just to take care of the skyrocketing demand for its special tools in automated industries. No standard tools will be produced at the new plant. The Multicut plant, shown in the architect's drawing, is the fourth Wesson expansion in the past two years. Previous expansion moves included the new Wesson Metal plant in Lexington, Kentucky, a new Wesson Research Center in Detroit and the new Wesson Cutting Tools, Ltd., plant in Toronto, Canada.

# General Purpose Grade Beats Specials on Tough Job




Tough machining jobs don't necessarily call for special carbide grades. Often a general purpose grade will do an even better job. Here is a case in point. The job shown above, was turning the OD of a steel coupling that was unusually tough and scaly. The forgings (low-carbon chrome-moly-vanadium) also had considerable warpage.

Depth of cut, as a result, varied from .070 to .180 inches. This, with all that scale too, caused enough tool breakage to keep output down to around 24 pieces per tool (4 per grind) even though specialized grades were used.

The job was re-tooled with a Wesson Multicut holder using throw-away carbide insert of WESSONMETAL 26—a broad range general purpose steel cutting grade. Output jumped to 100 pieces per cutting edge (800 per insert) with no grinding required.

Tool cost dropped from 48 cents per piece to only 1.4 mills each. In addition, output doubled since WESSONMETAL 26 made it possible to step up both feed and speed on the Gisholt lathe in addition to reducing tool-change downtime.

tools Wesson carbide Wessonmetal

**WESSON COMPANY DEPT. AD**
1220 Woodward Heights Blvd., Detroit 20, Mich.
*IN CANADA:*
**WESSON CUTTING TOOLS, LTD.**
93 LEICESTER AVE., TORONTO 18, ONTARIO

## COST CUTTING IDEAS PROVED IN OTHER SHOPS . . . Have you tried them?

When throw-away inserts are worn on all corners usable for turning, don't throw them away yet. In many operations, it is only the corner that really wears very much, leaving the rest of the insert as good as new. Switch it to a chamfering or facing operation.

• • •

When a part print comes from engineering with drill holes that have a high length to diameter ratio, see whether that ratio can't be reduced. If the ratio is cut in half you may be able to cut tool costs 80%. Tool costs go up much faster than depth of hole if diameter stays the same.

• • •

Don't assume that you've done a job on tool costs when you've cut the cost in half on a particular operation. Wesson engineers, time and again, have been able to help cut costs still further by on-the-job, in-the-shop engineering application.

# Mash Resistance Welding

## *How to Use It to Help Put the Profits Back Into Manufacturing*

### What is Mash Welding?

Mash welding is a type of resistance welding used to join the edges of two sheets of metal and produce a flush surface of the near original thickness of one sheet. After completion of the weld, both sheets lie on the same plane. The welded area, minutely thicker, requires only a minimum of finishing.

No gas, flux, or rod is required. Parts to be joined are simply placed between the welding electrodes . . . pressure is applied . . . a flow of current is passed through the piece parts via the electrodes. Natural resistance of the metal parts to the electrical flow creates a heat that causes the metals to fuse at the point of electrode contact.

To demonstrate: Fig. 1 shows the edges of two metal sheets that are to be joined over lapping, approximately the thickness of one sheet of the material. Fig. 2 shows flat faced wheel type electrodes being passed over the lapped edges. The welding current passes either continuously or in a series of closely spaced impulses.

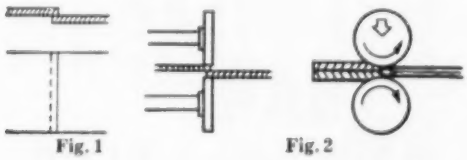


Fig. 1



Fig. 2

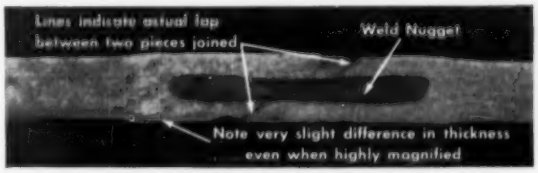

Lines indicate actual lap between two pieces joined
Weld Nugget
Note very slight difference in thickness even when highly magnified

**Fig. 3.** Macrograph of typical mash weld.

### When to Use Mash Welding

Employ Sciaky "Mash Resistance Welding" whenever you wish a flush joint without a weld bead, rivet heads, or exterior fastening of any kind. Typical applications are tanks and conical shapes where a minimum of exterior finishing is desired. An enlargement of a welded cross-section of a typical piece part application is illustrated in Fig. 3 . . . a strong, yet smooth, metal marriage.

## Advantages of Resistance Welding

Production increase and lower operating costs are direct results of the application of Sciaky resistance welding techniques. The simplicity and effectiveness of the Sciaky technique reduces multi-step fastening operations to just one. No skilled workers are required . . . one operator can consistently produce welds suitable to both quality and production requirements.

### Sciaky Patented Three-Phase Resistance Welders

Invented, pioneered, and patented by Sciaky, the Three-Phase principle of resistance welding allows a balanced current to be drawn from all three phases of the power supply. The three-phase balanced load, high power factor principle of operation offers direct savings in lower power bills, lower installation costs, smaller distribution lines, and smaller switch gear.

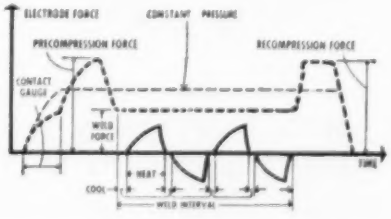



**Fig. 4.** Three-Phase Weld Sequence.

### Sciaky Plans for Tomorrow . . . at their New Research Center

Sciaky's new three-quarter million dollar Research Center is equipped with the most advanced resistance welding machines, testing instruments, and trained personnel devoted to solving *your* joining problems and advancing the application and development of resistance welding. The Research Center invites *you* to submit your fastening problems.

### Build Your Data File with FREE Sciaky Literature

Write today on your company letterhead describing your particular field of interest. We will send suitable back issues (as well as future issues) of our "Resistance Welding At Work" publication, showing typical joining problems solved by this method of fastening. All contain impressive case history examples of Sciaky basic thinking—resistance welding techniques designed to *put the profits back into manufacturing.*

*Largest Manufacturers of Resistance Welding Machines in the World*

SCIAKY®

**Sciaky Bros., Inc., 4933 West 67th Street, Chicago 38, Ill., Portsmouth 7-5600**

1. Simplified cross-slide camming
2. Interchangeable cross-slide tool holders
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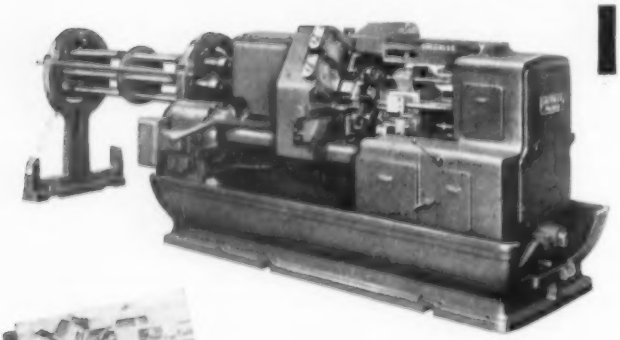

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### *Change lubrication methods from*

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***saves 95 man-hours for every 400-lb. drum of lubricant you use***

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**Products of STEWART-WARNER CORPORATION**

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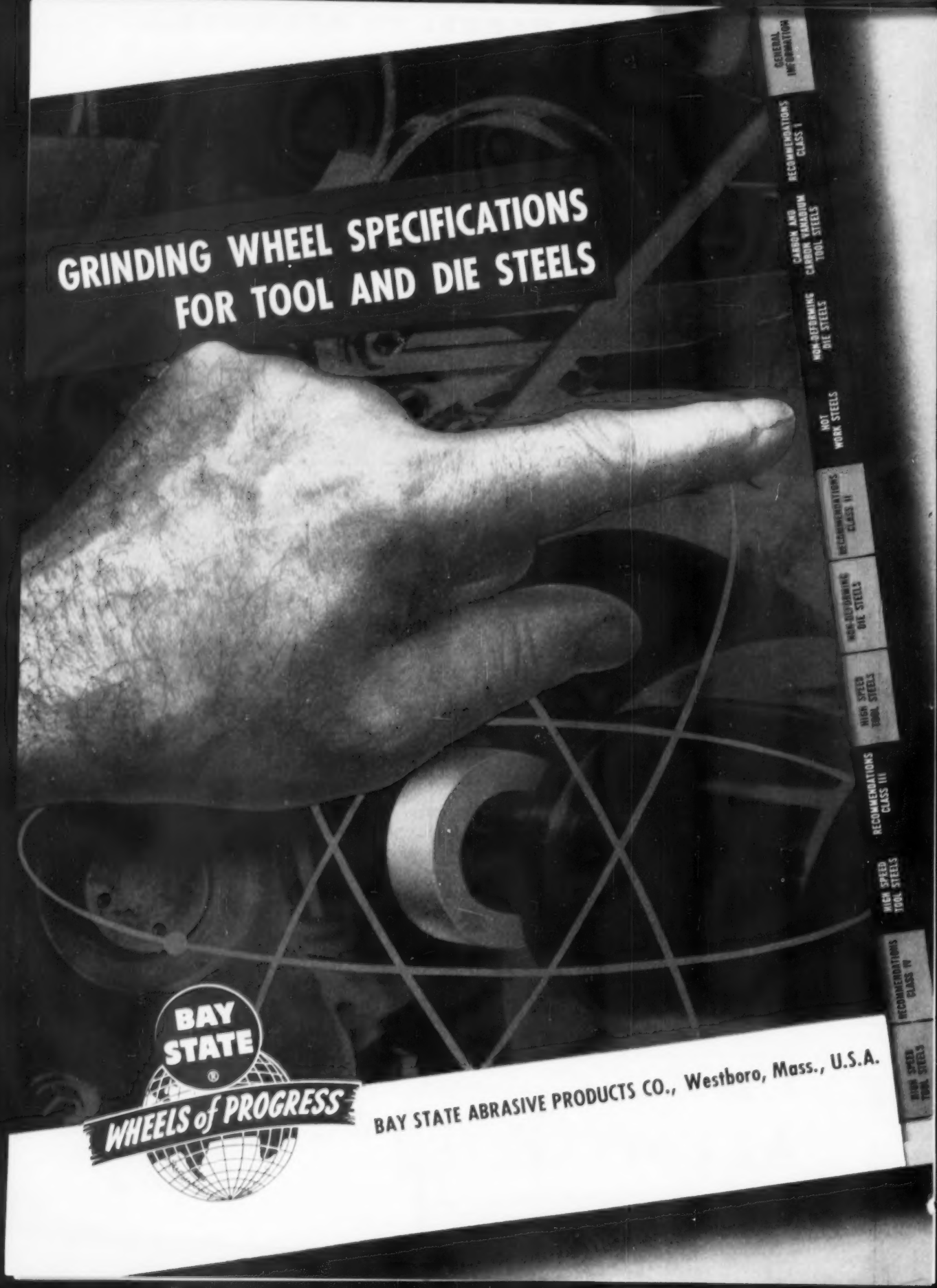
GRINDING WHEEL SPECIFICATIONS
FOR TOOL AND DIE STEELS
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NON-DEFORMING DIE STEELS
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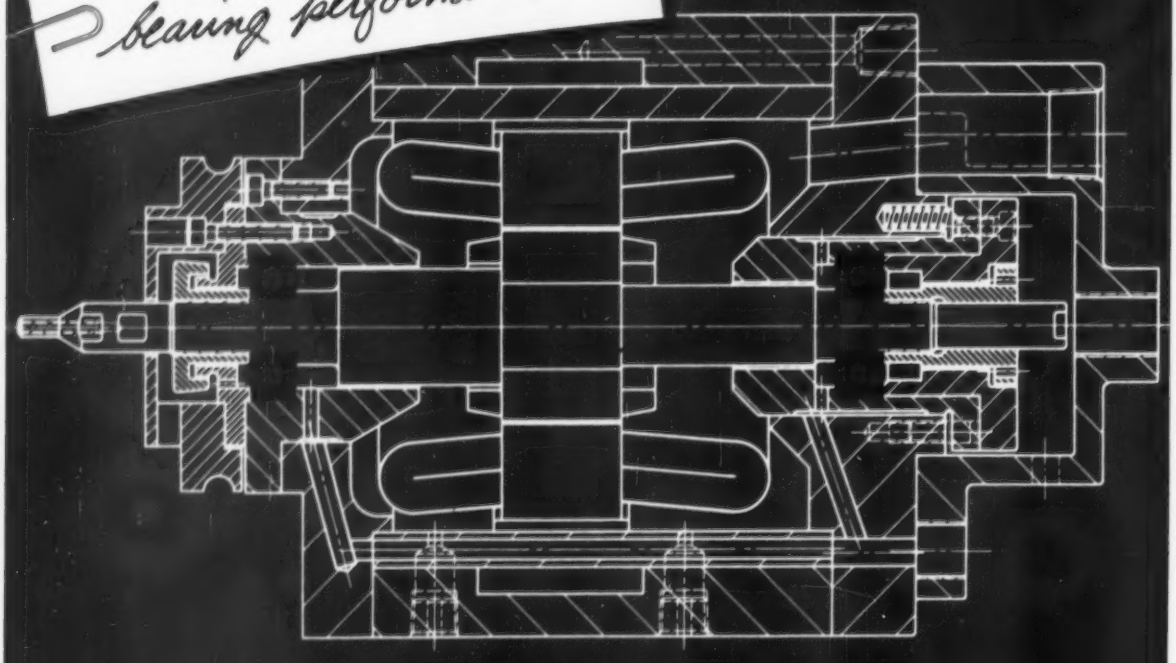

# over 14 billion revolutions...

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Fafnir Super-Precision MM201W1-CR spring-loaded ball bearing, the type specified for wheelhead illustrated.

**Fafnir-equipped, high-speed, oscillating grinder wheelhead demonstrates machine tool progress in performance**

This extraordinary record has been made on the production line by a Pope-built wheelhead, grinding the races of extra-precision ball bearings. The hi-frequency motorized wheelhead operates at 72,000 rpm. The motor is water-cooled and bearings lubricated by means of an oil-air mist system.

When designing this oscillating grinder wheelhead, Fafnir engineers worked together with the Pope Machinery Company engineers in the selection and application of bearings. The type of bearing recommended is shown at the left and its application in the drawing above. Its performance record, according to Pope, demonstrates progress to match today's improved machine tools.

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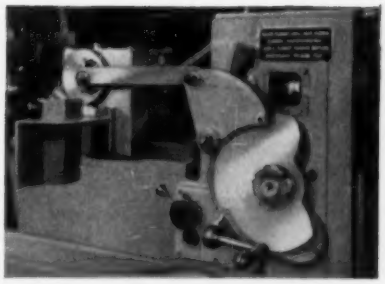
SPINDLE PERFORMANCE . . . 20% to 50% higher than competitive machines. The spindle, with preloaded, angular contact, double ball bearings at the nose, is designed to withstand high tool pressure. High production speeds are easily maintained.



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3

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# "Magnamatic"

# Shifts to Neutral at desired torque

*reduces work spoilage*

"Magnamatic" is the only "One-Shot" type of Controlled-Torque screwdriver-nutrunner that has proven itself in two years of heavy-duty "on the line" service in industry! Typical of hundreds of satisfied users is a large mid-western company, whose 40 "Magnamatic" Screwdrivers-Nutrunners have:

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- **Reduced noise levels from 83 to 68 db.**
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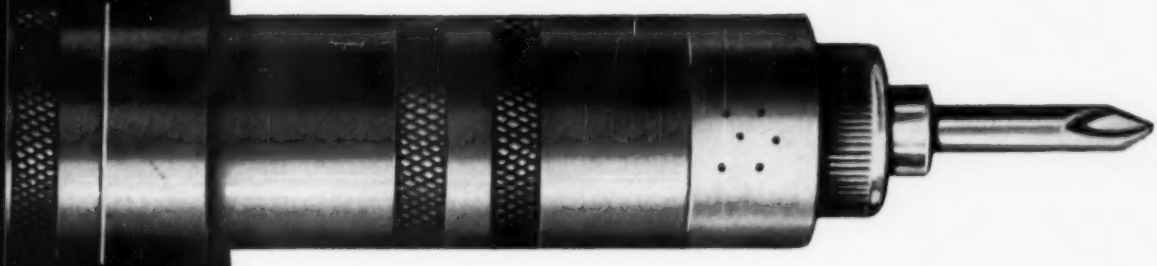

The instant a "Magnamatic" air-driven screwdriver-nutrunner reaches desired torque its automatic "One-Shot" clutch shifts to neutral. There's no harmful hammering, impacting or ratcheting to run fasteners past proper tightness and to damage surfaces, break bits, burr screw heads, strip threads or shear fasteners. And "Magnamatic" is *Quiet* . . . clutch buzz is eliminated and exhaust noise is muffled by a new principle of baffling. For complete details call your Chicago Pneumatic sales office or mail coupon. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

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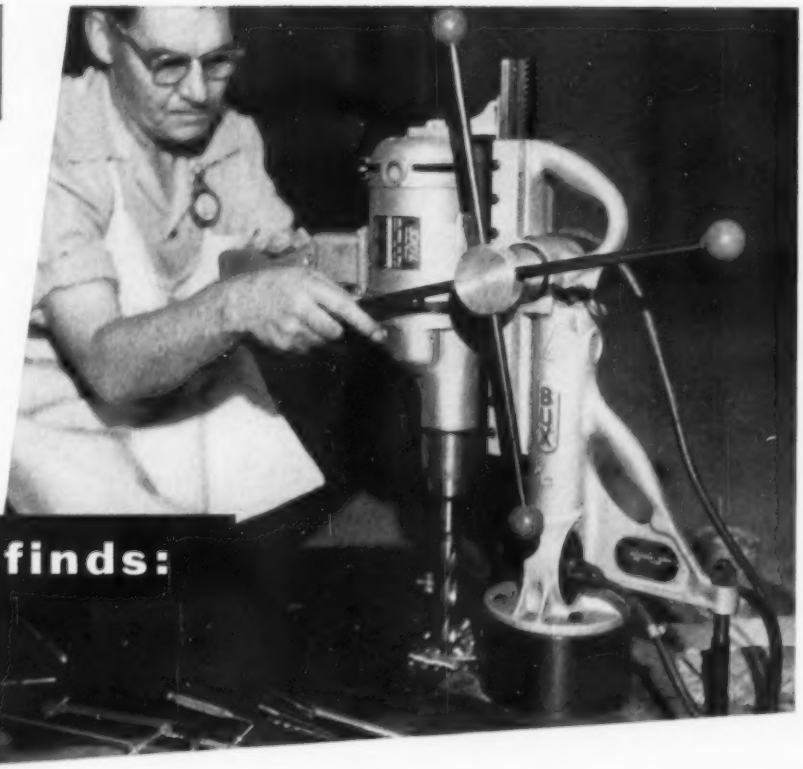

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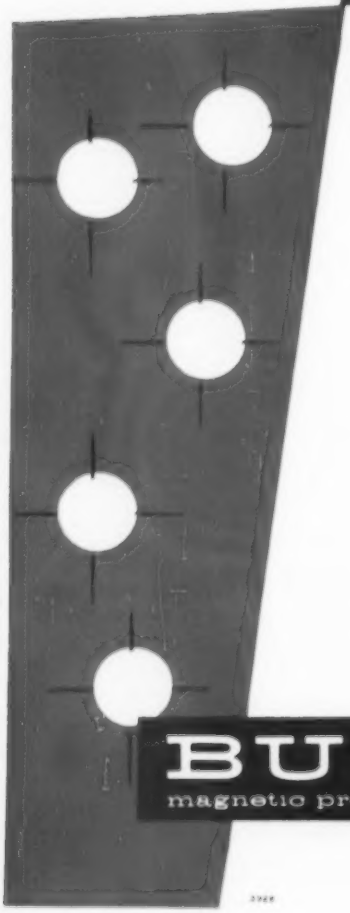

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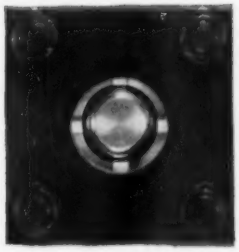

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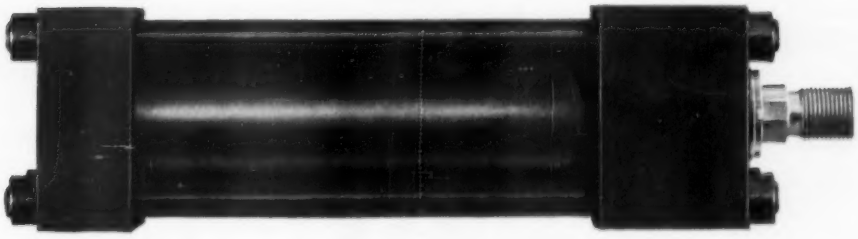

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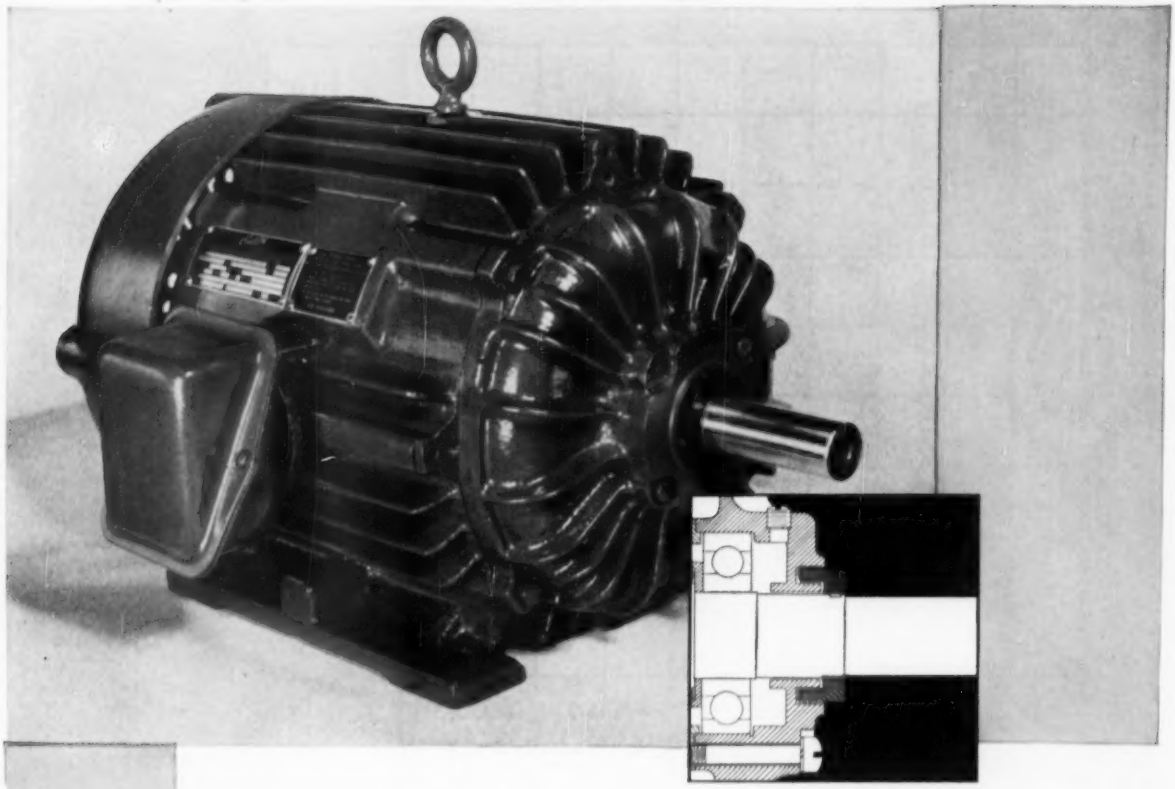

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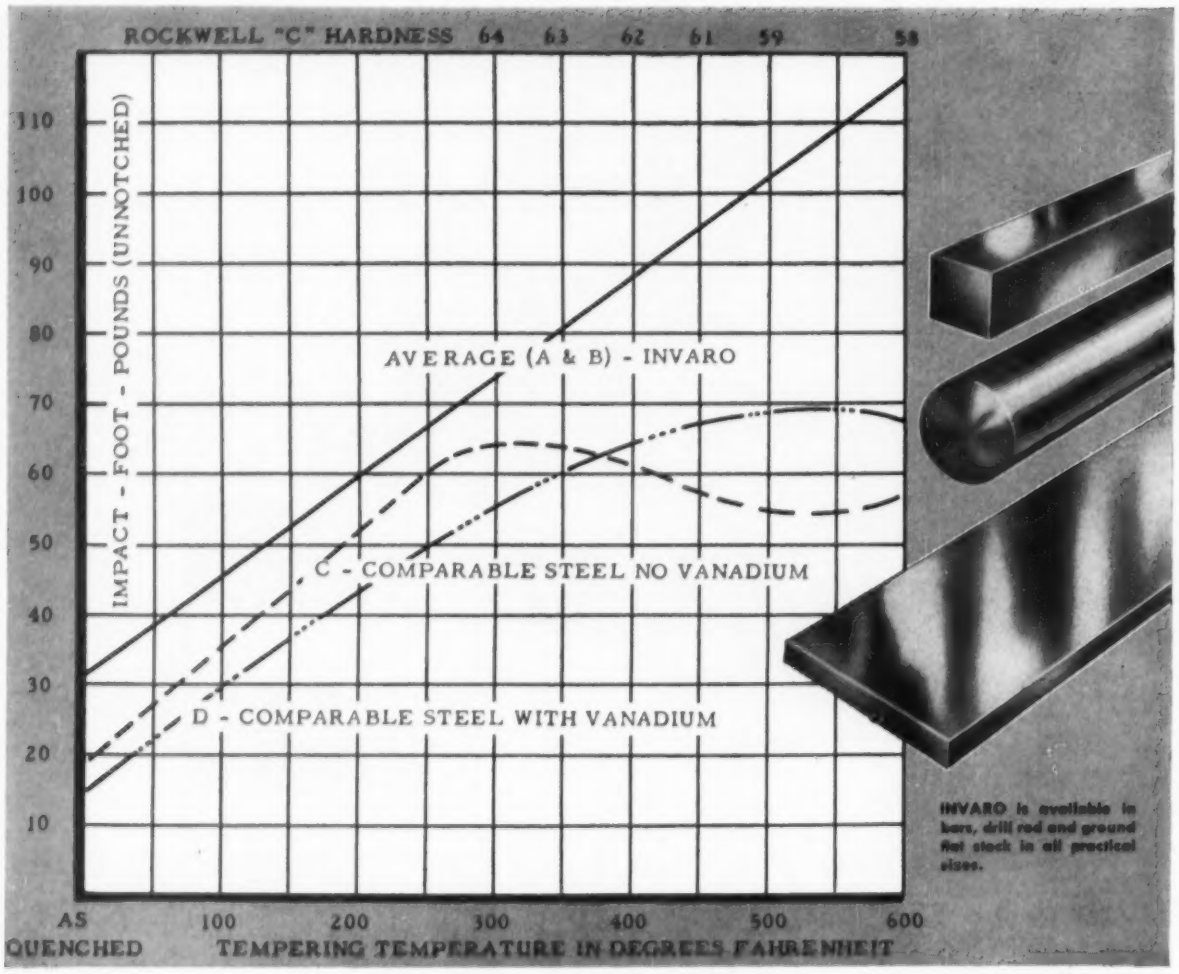


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## of leading comparable oil-hardening tool and die steels

When the toughness of a tool and die steel is the critical factor of selection, Firth Sterling INVARO is the *toughest* of the tough! That's not just an opinion but a *fact.* Undeniable proof is established by the A.S.T.M. Izod Impact Test, results of which are graphically shown above, comparing steels both with and without vanadium.

INVARO shows a superior toughness in *all* ranges of temperature from a minimum advantage of about 12% to as much as 100% greater! This marked superiority is the result of Firth Sterling's advanced metallurgical practices combined with 67 years of experience in the art of making specialty steels.

Yes, when you want *toughness* in your tools and dies, combined with uniformity, excellent hardening properties and safety in heat treating . . . specify INVARO.

| Chemical Analysis | *All test samples were machined from half-inch annealed bar stock.* C | Si | Mn | S | P | W | V | Cr |
|---|---|---|---|---|---|---|---|---|
| Invaro A | .88 | .34 | 1.22 | .010 | .020 | .49 | .19 | .50 |
| Invaro B | .94 | .25 | 1.20 | .014 | .013 | .53 | .22 | .49 |
| Comp. C | .90 | .33 | 1.24 | .011 | .025 | .50 | — | .55 |
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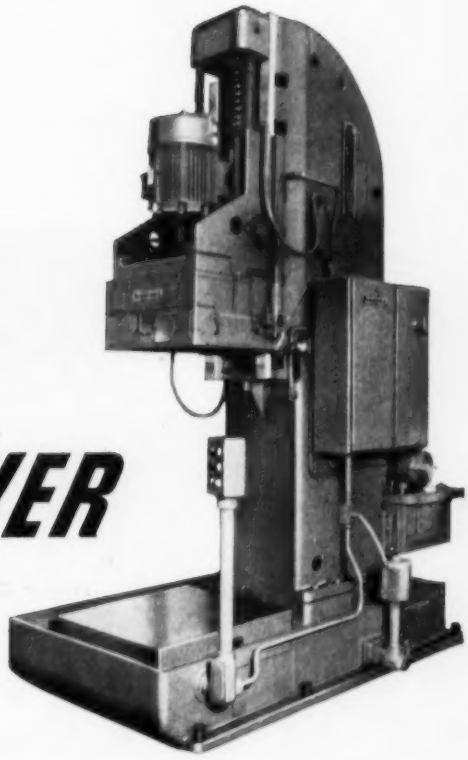
High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

# FAST CHANGEOVER

suits small-lot runs,
provides continuous operation on
**BARNESDRIL**
hydraulic-feed, way-type
**drilling machines**



Before you buy any drilling equipment, see these new BarnesdriL hydraulic feed Drilling Machines. Auxiliary Multiple spindle heads, with adjustable centers and slip plates, give you quick changeover to the number of spindles and drill patterns you need to meet production schedules on small runs. No costly set-up or loss of production time is necessary. By taking advantage of this flexibility and quick production changeover which these machines offer you can maintain continuous production operation with minimum cost per piece on a wide range of work.

This BarnesdriL machine is arranged with a 16-spindle auxiliary head, designed with adjustable center spindles and slip plates to employ any number of spindles in any pattern desired. The ease of changing production set-ups by substituting a new slip plate and fixtures keeps this machine operating full time on a high production basis.

**these features keep maintenance costs low**

**Direct Motor Drive Eliminates Linkage**
**Ample Stroke Clearance for Easy Tool Change**
**Hydraulic Cylinder Serviceable without Dismantling Unit**
**All Valves Flange-Mounted**
**Hydraulic System is Manifold-Arranged**

Ask for an estimate on processing your short run drilling operations, using these new BarnesdriL Machines. Send for a copy of Bulletin No. 700.

**BARNES DRILL CO.**

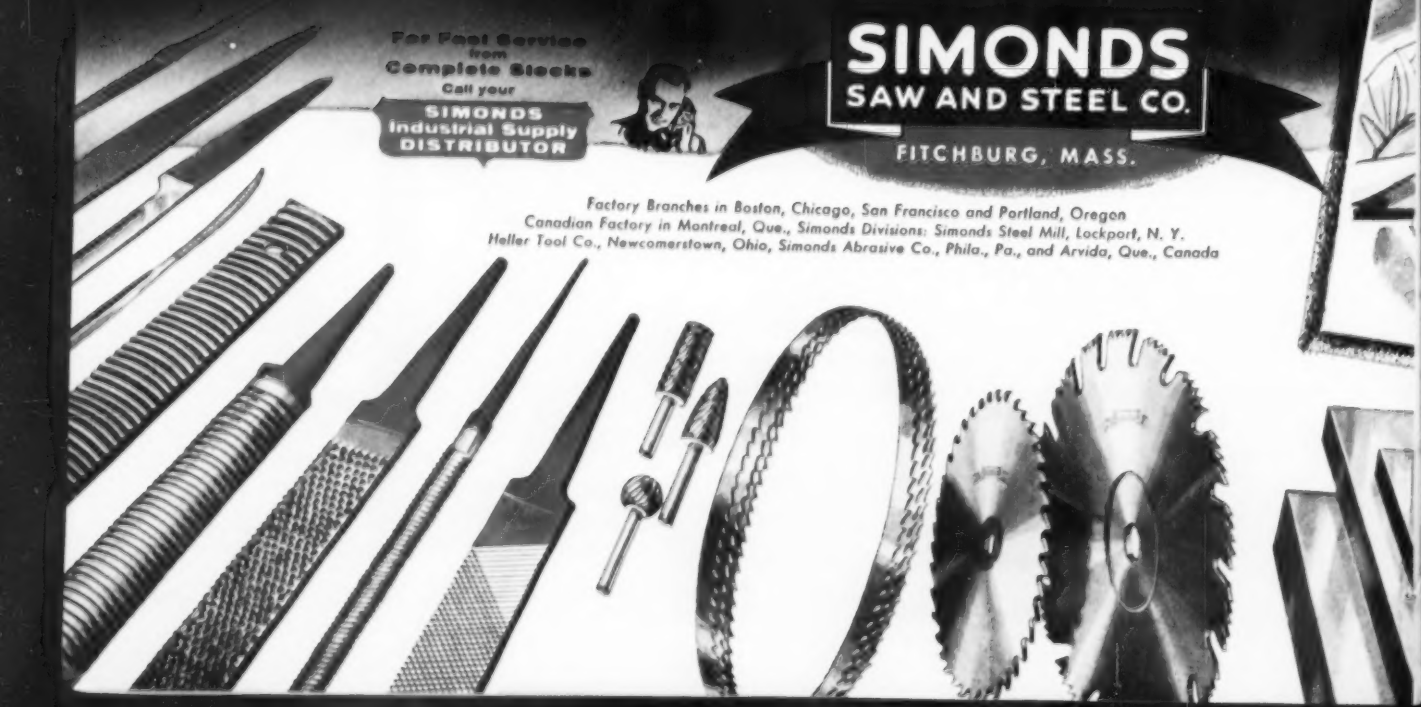
830 CHESTNUT STREET • ROCKFORD, ILLINOIS

NEED AN ACTIVE PARTNER TO SHARE YOUR BUSINESS BURDENS?

THEN MEET YOUR

# SIMONDS

# INDUSTRIAL SUPPLY DISTRIBUTOR




Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

## PURCHASING

He knows your needs so well . . . and when they will re-occur . . . that he keeps way ahead of you on ordering. He knows almost exactly what you'll need . . . at almost exactly the time you'll need it . . . and he has those Simonds Tools *right there and ready.*

## STOCK KEEPING

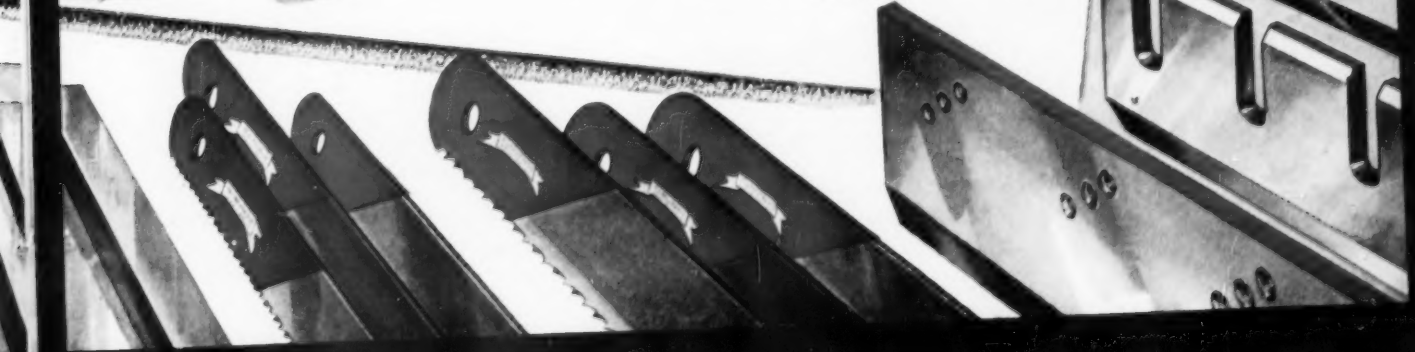
It follows that your Simonds Industrial Supply Distributor keeps well ahead of you . . . keeps your certain needs in his own stock-room . . . saves *you* space and warehousing cost . . . in fact, *he serves as an annex to your own plant.*

## BOOKKEEPING

Your Simonds Industrial Supply Distributor takes care of all your needs on one order and one invoice . . . saves you paper work . . . saves checking back and forth.

And when all is said and done, he's the man who knows how to help you get the best results out of the best Metal-Cutting and Wood-Cutting Tools made . . . the Simonds red-trademarked line that's 100% quality-controlled from our own steel mill right through to *your plant.*

It's good business to do business with *your Simonds Industrial Supply Distributor.*



# Compare this latest jig borer for capacity accuracy speed!

## KNIGHT'S New Jigmaster

Last word in medium size jig borers—unequalled for extreme accuracy, capacity, increased output.

The totally enclosed spindle and quill mounted on super-precision ball bearings, with quill moving in a solid bearing . . . the extra-wide base and reinforced column, both cast as a single unit . . . the wider bearing surfaces . . . all contribute to the Jigmaster's exceptional rigidity and accuracy.

Any one of three table and saddle locating devices may be used for hole location. All machine controls can be operated from a single convenient location.

*Write For Complete Information*

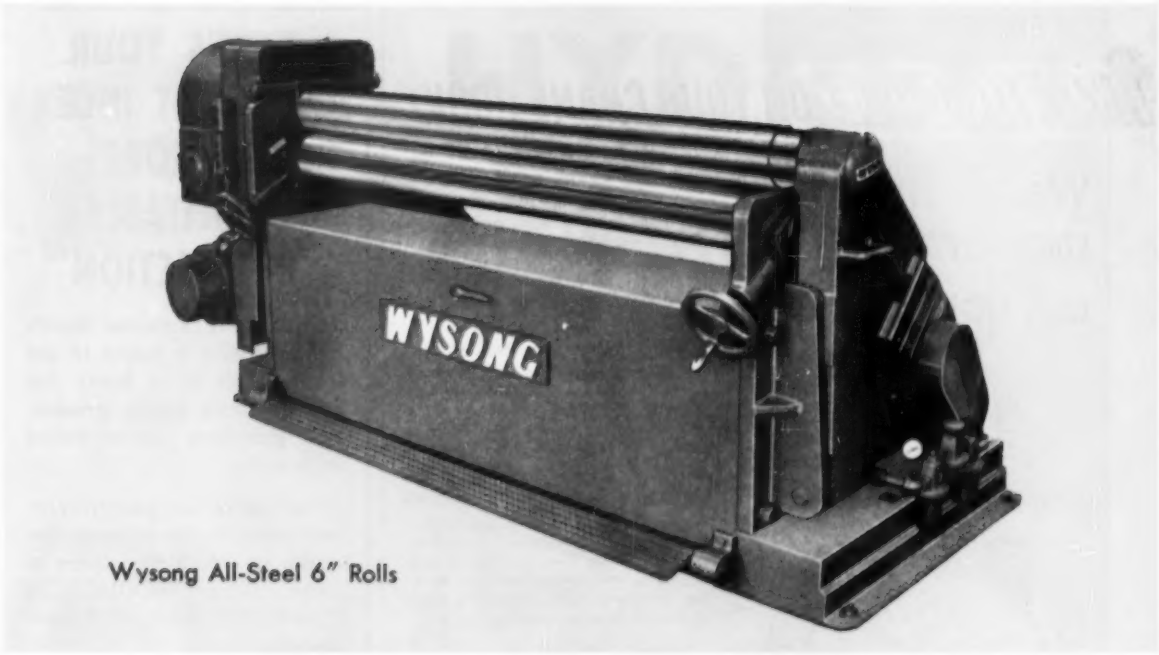
### SPECIFICATIONS

| | |
|---|---|
| Table Size | 18" x 24" |
| Table Travel—Longitudinal | 20" |
| —Cross | 15" |
| Vertical Capacity | 23" |
| Throat | 20" |
| Weight | 7500 Lbs. |

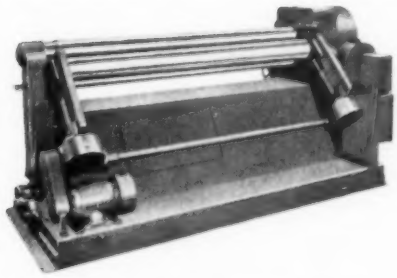
*See our brief catalog in Sweets*

KNIGHT VERSATILE ACCURATE RIGID

**W. B. KNIGHT MACHINERY CO. • 3920 WEST PINE BLVD. • SAINT LOUIS 8, MO.**




Wysong All-Steel 6" Rolls



Rear view. Motor at left provides power for adjustment of rear roll. Air vitalizer section of air operation of drop end is shown on left end.

Top push button panel controls rear roll. Lower panel provides stop, start and reverse for roll drive.

Hand lever controls air valve for lifting top roll.

# New WYSONG All-Steel 6-INCH ROLLS

Wysong All-Steel Bending Rolls have created a *new* standard for safety and ease of operation. They are available in 4¼ inch, 5 inch and 6 inch diameters and working lengths from 36" through 120".

Wysong rolls are of the initial or pinch type. High production and safety features include:

- Single hand wheel for parallel adjustment of rear roll (power adjustment with ¾ HP magnetic brake motor optional on 6" series.)
- A single lever to release drop end. Lowering drop-end raises top roll. (Air power operation optional on all models.)
- Safety treadle extending full length. Stepping on treadle stops machine.
- 7½ H.P., 1800 R.P.M. drive motor (magnetic brake motor optional.)
- Worm gear drive runs in oil.
- Accurately machined, alloy steel rolls, grooved to buyers specifications.
- Easy-to-read, roll-setting indicator scales.

See your dealer or write to factory for full information. Wysong also builds power, air-power and foot-power squaring shears and hand-operated slip roll formers. Wysong & Miles Co., Greensboro, N.C.

WYSONG

"Buy a Wysong . . . It's Miles Ahead"

use a

# ®HYDROSCALE ON YOUR CRANE HOOK!

**ALL WEIGHING IS DONE ON YOUR CRANE HOOK**

You merely hang the HYDROSCALE on the crane hook, or hoist, and leave it there. Then, whenever you lift a load, you'll automatically weigh it, as you lift it. *No extra equipment or plant facilities are required.*

**OUTMODES COSTLY CENTRAL WEIGHING STATION**

By eliminating the central weighing station, you realize substantial savings in time, floor space and money. And, you provide for automatic weighing at any step in your crane operations, at a fraction of the former cost.

**TYPICAL WEIGHING APPLICATIONS**

Just a few of the many applications include—loading, unloading, batching, check weighing, foundry charging, production control, process control, checking inventory, and, protecting your equipment from overloading.

**COMPLETE LINE OF 110 MODELS NOW AVAILABLE**

There's a model to meet most any industrial weighing requirement, and to suit every crane application. Our largest model has a capacity of 200,000 pounds, while our smallest model has a capacity of 500 pounds. They're engineered and built for long service life, and can be used on any standard crane or hoist.

***HYDROSCALES guaranteed for one year***

They are guaranteed to be free of defects in workmanship and materials, and to be accurate to ½ of 1% of the maximum dial capacity—for 1 year.

Write for descriptive literature explaining model features.

## HYDROWAY SCALES, INC.

20612-A West 8 Mile Road • Detroit 19, Mich.

"The world's largest producer of crane scales"

**Handle your small part precision JIG BORING on the LINLEY JIG BORER**

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, where large work belongs. You'll save money this way.

***SPECIFICATIONS***

Table Movement: 6" x 10" — Table Size: 7" x 17½"

*Complete details sent promptly on request*

**LINLEY BROTHERS CO.**

664 STATE ST. EXT., BRIDGEPORT 1, CONN.

## HERE'S YOUR CONSTANT INDEX TO MORE PROFITABLE PRODUCTION

This is just a reminder there's an easy way in which to get information in a hurry for solving those knotty production problems you're faced with daily.

Listed below is a general subject index to the answers you need, as you'll find them in your 1955 PRODUCTION PLANBOOK issue of *American Machinist*.

- **A** Management, Personnel
- **B** Machining
- **C** Tooling
- **D** Pressworking, Molding, Casting
- **E** Inspection, Testing, Quality Control
- **F** Assembly, Welding, Portable Tools
- **G** Heat-Treat, Cleaning, Finishing
- **H** Materials, Components
- **I** Materials Handling, Services
- **J** Prize Ideas, Rebuilt Equipment

And that's not all. An integral part of these ten sections are hundreds of informative advertisements . . . a list of manufacturers offering free product literature . . . and an alphabetic listing of products and services advertised in the PLANBOOK.

*Information like this can help you find sure roads to faster, lower-cost production.*

**American Machinist**
**McGraw-Hill Building**
**New York 36, N. Y.**

AVAILABLE NOW

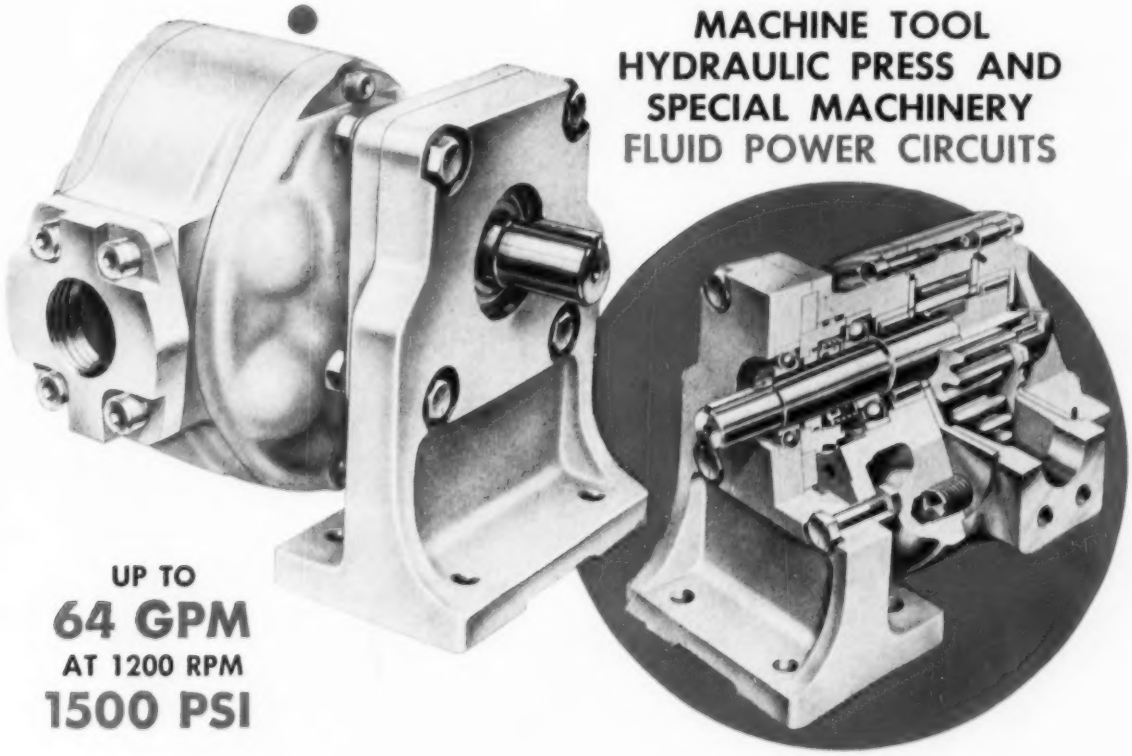
# HYDRECO®

## GEAR PUMPS

## WITH INDUSTRIAL MOUNTINGS

FOR

**MACHINE TOOL**
**HYDRAULIC PRESS AND**
**SPECIAL MACHINERY**
**FLUID POWER CIRCUITS**



**UP TO**
**64 GPM**
**AT 1200 RPM**
**1500 PSI**

HYDRECO Gear Pumps, for years, have been specified as standard Fluid Power equipment by the *big names* in Construction, Earth Moving and Materials Handling Equipment. On these rugged-service applications HYDRECO Gear Pumps perform with outstanding dependability. They will operate under conditions of pressure, temperature, and speed unheard of on the usual industrial application. Mobile Equipment is a highly competitive field and HYDRECO Pumps have always afforded design engineers substantial economies in original equipment costs!

HYDRECO Gear Pumps are now available with standard industrial mountings, port connections and shafts. Builders and users of Machine Tools, Presses, and Industrial Equipment can now profit by the economies in these Pumps.

Make this simple test! If your hydraulic cycle is comparable to that of a tractor-shovel digging a foundation . . . a front-end loader working a gravel pit . . . or, a mammoth bulldozer crowding a bank . . . and working at full relief pressures nearly all the time – then YOU can use HYDRECO Gear Pumps to advantage! HYDRECO Gear Pumps can save YOU money NOW – in both original equipment and replacement costs.

Member NFPA

*Write for performance and installation data on HYDRECO Gear Pumps with Industrial Mountings.*

**KALAMAZOO DIVISION**
**THE NEW YORK AIR BRAKE COMPANY**

9001 E. MICHIGAN • KALAMAZOO • MICH.

INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

Kalamazoo Division
The New York Air Brake Company
9001-9 East Michigan, Kalamazoo, Mich.

Kindly send me full information on HYDRECO Gear Pumps with Industrial Mountings.

Name _____

Company _____

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## speeds for carbides **plus** heavy-cut efficiency

low range to 100 fpm . . . for extreme depths of cut and maximum feeds

medium range to 150 fpm . . . for average cuts in medium steel or cast iron

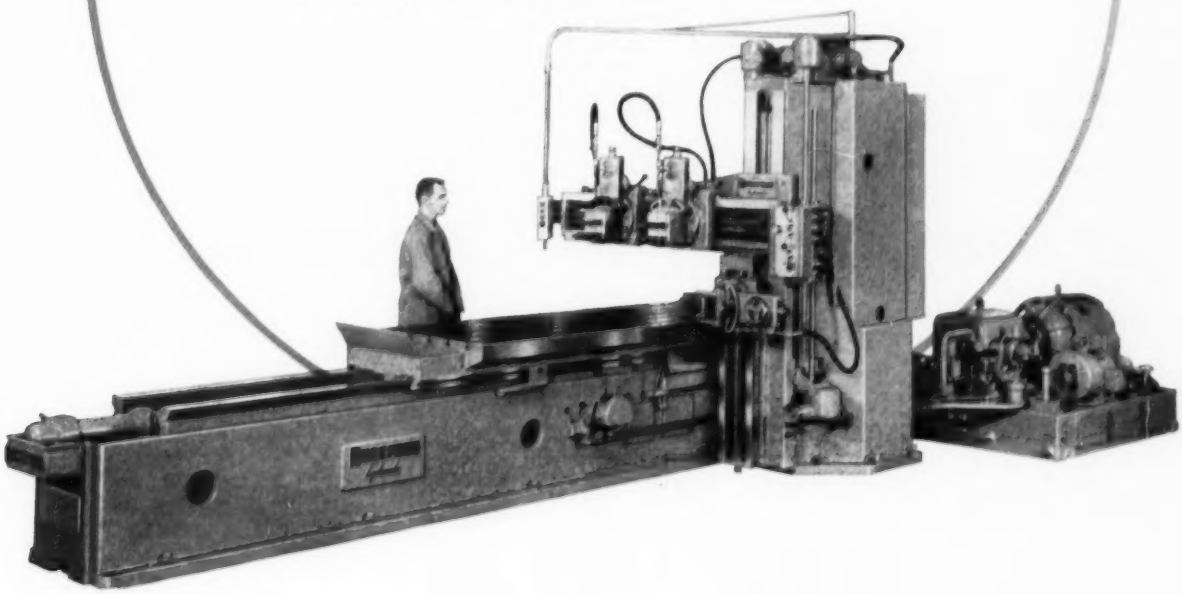
high range to 300 fpm . . . for carbide planing of steel and non-ferrous metals

# with triple circuit h3 drive

The new heavy duty Model OGN Hydraulic Shaper-Planers are equipped with triple circuit h3 drive to combine the ruggedness and cutting efficiency of single circuit planers, with the speeds required for carbide planing. Three distinct ranges of cutting speed are provided, with power inversely proportional, to give the correct combination of speed and force to most economically machine any metal.

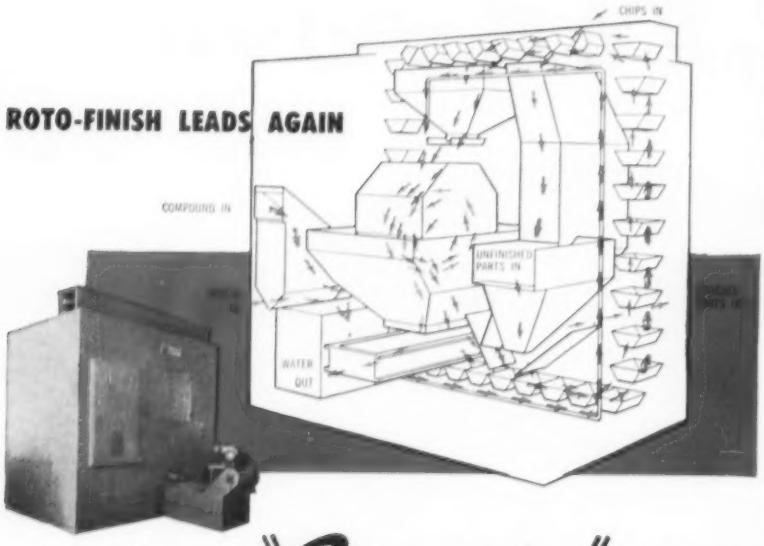
Hydraulic drive is ideally suited for carbide tooling, since optimum cutting speeds can instantly be set for any tool. Tools also enter the cut more smoothly with hydraulic drive to reduce the tendency for fracturing brittle carbide tips.

A Rockford Machine Tool Co. representative can demonstrate these advantages for you. Ask your local dealer for full details, or write us for a copy of Bulletin No. 1200.



**ROCKFORD MACHINE TOOL CO.**
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

HYDRAULIC




ROTO-FINISH LEADS AGAIN

the new "Rotomation" MACHINE

MAKES MECHANICAL TUMBLING A FULLY AUTOMATIC BARREL FINISHING PROCESS

- Completely Automatic
- Needs no operator in attendance
- Loads and unloads itself with each cycle.
- Cycle variable for different part requirements.
- Provides continuous operation
- Assures uniformity of finish
- Low cost operation — high production
- Complete package unit
- Simple to install . . . Electric, water, air and drain connections only.
- Suitable for straight line production.
- Thus, "Rotomation" barrel finishing machine becomes a machine tool.

Roto-Finish COMPANY

ROTO FINISH

3740 MILHAM ROAD, KALAMAZOO, MICH.

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ORIGINATORS OF THE ROTO-FINISH PROCESS



BUZZER Reg. U. S. Pat. Off.

INDUSTRIAL GAS EQUIPMENT

NO BLOWER OR OTHER POWER NEEDED

JUST CONNECT TO GAS SUPPLY

BUZZER Equipment, a buy-word since 1911, provides the hottest and quickest heating . . . without blower or power. Wide range of turn down and heat control. You can depend on a BUZZER.

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Atmospheric Pot Hardening Furnaces

Mfrs. since 1911

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126 SO. GRAND AVE., BALDWIN, L. I., N. Y.

BURNERS · FURNACES [Heat Treating, Melting, Soldering]



## INDUSTRIAL ENGINEERING HANDBOOK

*Just Published*

Factual and how-to-do-it in approach, nearly five years in preparation, this book provides a storehouse of dependable information on every important aspect of industrial engineering: material handling, job evaluation, work measurement, wage payments, plant facilities and design, automation, linear programming — to name but a few. **H. P. Maynard, Editor-in-Chief.** 1510 pp., illus. $17.50.

## INDUSTRIAL ORGANIZATION AND MANAGEMENT

This book shows you how to set up, coordinate, and keep in smooth running order every department of an industrial enterprise. It shows you how to cut out wasteful duplication among departments . . . how to maintain your plant and equipment for longest wear . . . how to get your product flowing to the market at the best rate, saleswise. **By Bethel, Atwater, Smith and Stackman.** 719 pp, 133 illus., $6.75

## The FOREMAN'S HANDBOOK

Twenty-four experts give you information that will help you every day on the job. Facts on work simplification, quality control, training, etc., provide scores of tips to improve production and lower costs. Third edition gives systems of predetermined time standards, "Standard Minute System" of incentive wage plans, plus a Self-Quiz for executive development. **C. Heyel, Editor.** 577 pp, 84 illus., $6.50

## MOTION AND TIME STUDY

Sets forth how-to-do-it operating procedures successful in measuring all types of work. Details new techniques and adaptation as well as older methods, with emphasis on individuals in operator, union, and management groups. Product design, materials specifications, control systems, etc., are included with the motions of the human being as areas to which motion and time study can be applied. **By G. Nadler.** 597 pp., 209 illus., $7.50

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*We say this without reservation—will back it up with proof:*

# New Balanced Mobil D.T.E. Oils Can Improve Your Production And Reduce Manufacturing Costs

For years Mobil D.T.E. oils have set the standard of quality for all hydraulic and circulating oils. Recently they were dramatically improved—so much so that their margin of superiority is now greatly increased.

New Mobil D.T.E. oils are *balanced* to meet the widest range of operating conditions. They will give years of trouble-free service—even in continuous high temperature circulating systems. They will keep your machines free from deposits over the complete range of service. They will give you the highest degree of protection against wear...rust...corrosion. In fact, tests show *most machines will become obsolete before these oils need changing* when operating at normal temperatures.

Let us show you concrete *proof* that new balanced Mobil D.T.E. oils can improve production and cut manufacturing costs. Ask your Mobil representative for the "balanced" story.

SOCONY MOBIL

***FIRST STEP IN CUTTING COSTS***

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

**GUIDE PINS and GUIDE PIN BUSHINGS**

Because high production, quality control and longer die life have become all-important, most stamping plants have now standardized on Lamina guide pins and Lamina bronze-plated bushings.

All Lamina wring-fit bushings are pre-finished on the I.D. Seated on a ground shoulder square with the surface of the die shoe and secured by special retainers, they assure distortion-free, full bearing surface that results in better die alignment, less maintenance and longer die life.

Lamina guide pins are special tool steel, heat treated, spray quenched, ground and burnished. The uniform, hard surface resists wear and the tough core prevents bending during installation or use. The pins are dimensionally accurate, do not "mushroom" or get out of round, and require no "running in".

There is a type and size Lamina Guide Pin and Bushing for every need. Our new catalog gives illustrations, applications, dimensions and prices of more than 800 items. Write for free copy.

LONG SHOULDER TYPE—Small toe clamp. Use to keep guide pin in bushing during stroke. Long wearing bronze plated on hardened steel. ½" to 1" pin dia.

HEAVY DUTY—Large toe clamp for large and heavy die sets requiring extra body and shoulder thickness. Bronze plated 2" to 3" pin diameter.

INJY TYPE—For wide range of requirements. Available in 5 sizes, 1" to 2" pin diameter. Long wearing bronze plated on hardened steel.

LONG SHOULDER TYPE—Large clamp. Long bearing surface contains pin during entire stroke. 2" to 3" pin diameter. Bronze on steel.

SHORT SHOULDER TYPE—For die space, more bearing area within die area. Bronze on steel or solid Ampco Bronze. 7 lengths, pin sizes ½" to 2".

RING CLAMP TYPE—For heavy duty and bossed die sets. Bronze-plated steel or Ampco Bronze. 4 lengths, pin diameter 2½" to 4½".

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

**From the *American Machinist* Library of *Tips for Top Shop Men***

BE MAN enough to stand up and fight for what you say and believe—or don't say it. If you're afraid of the boss, making remarks behind his back won't give you confidence.

# Can You Compare...

. . . the age and types of production machinery and equipment in your shop with that: (1) in Metalworking generally (2) in each of this industry's 15 major manufacturing divisions, and (3) in each important geographical area?

You *can*, if you have a copy of the Seventh *American Machinist* Inventory of Metalworking Production Equipment. In fact, this Inventory is the only source for this vital information.

This exclusive *American Machinist* service gives you a true yardstick by which to judge the relative modernity of your shop . . . and then provides you with all the evidence you want to back up a decision to replace old and inefficient equipment with new. When you use it, you'll find, as have so many other production men, that there is no better way to arm yourself with convincing, authoritative arguments for an accelerated replacement and modernization program.

Originally, this seventh Inventory was a feature of the 1954 Production PLANBOOK issue of *American Machinist*, so you may already have its 96 fact-crammed pages on your library shelves. But if you need extra copies of this invaluable obsolescence report, you'll be glad to know that a limited supply of reprints still is available. Copies are $2.00 each. To get yours promptly, write or call . . .

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**American Machinist**

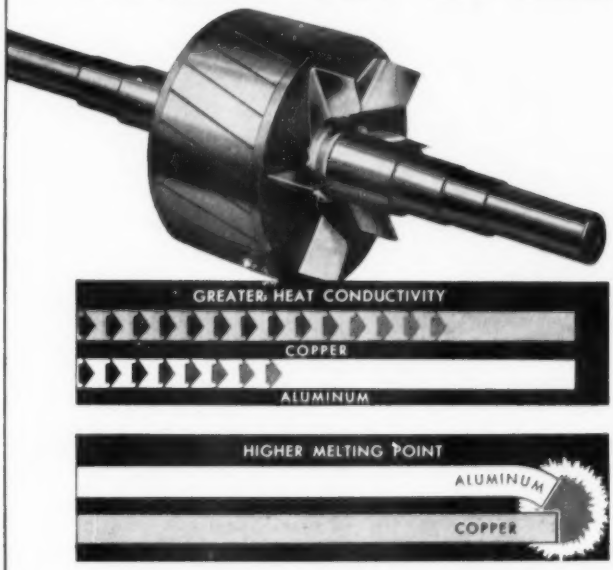
**McGRAW-HILL BUILDING**

**NEW YORK 36, N. Y.**

# HEAT DISSIPATING COPPER-CLAD ROTORS

PLUS values in power

## in HOWELL series one hundred motors give you



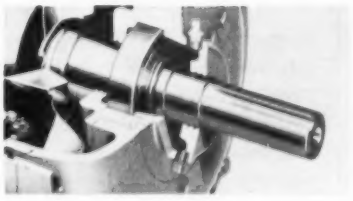

### COOL-RUNNING EFFICIENCY, GREATER ABILITY TO WITHSTAND ABUSE

The copper bar rotors of Howell Series 100 motors mark a basic difference between these and motors with cast aluminum rotors. Copper's greater heat conductivity insures that internal motor heat is dissipated faster . . . before it can deteriorate vital insulation and shorten motor life. The diagram at left shows why . . . copper's heat conductivity is 91% greater than aluminum's.

What's more, copper's higher melting point . . . 1083° F. against 660° F. for aluminum . . . plus the inherent uniformity and greater strength of Howell's copper-clad rotors, means substantially more stability under overload conditions.

There's a world of difference in motors. Compare . . . and you'll specify Howell Series 100.

## GET THE PLUS values THAT COUNT....specify HOWELL series 100 motors

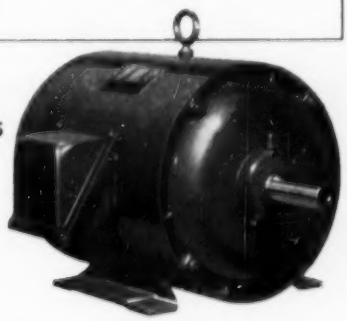


### bearing protection doubled for longer motor life

On Series 100 TEFC motors, bearing cartridges defy dust and dirt, even when the motor is disassembled for servicing. You can't buy better assurance of motor dependability.

### steel feet and frames won't crack under stress

Unlike cast iron, steel feet won't crack when mounting bolts are tightened too much . . . and Howell's steel frames take more installation punishment.



### smaller, lighter, better looking

Save machine and storage space, save shipping weight, and get new functional streamlining that matches the motor to your most modern machine design or production equipment. Why put up with dust catching fins on a motor, when sleek good appearance costs no more.

*For more details on Series 100 motors, write for Bulletin N-100-R*

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

HOWELL Red Band MOTORS

# HOWELL MOTORS

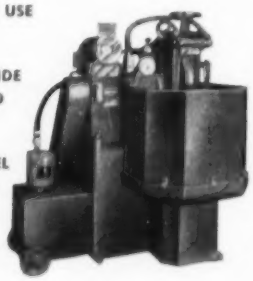
HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

# ELIMINATE
## Costly "Guess Work"

WITH THE

**Oliver TEMPLATE**
TOOL BIT GRINDER

- POSITIVE DUPLICATION ASSURED BY USE OF A MASTER TEMPLATE.
- GRINDING ON SINGLE POINT CARBIDE TOOLS REQUIRES SECONDS INSTEAD OF MANY MINUTES.
- 20" NOTCHED SILICON CARBIDE WHEEL ELIMINATES DIAMOND FINISHING OPERATION IN MOST INSTANCES.
- MACHINE IS EQUIPPED TO PROVIDE WATER BOTH THROUGH THE WHEEL AND ON THE WHEEL FOR CARBIDE GRINDING.
- CAPACITY: TOOL BITS UP TO 1½" WIDE x 1¾" HIGH.
- SPECIAL SHAPES AND SIZES MAY BE HANDLED IN SPECIAL HOLDERS.



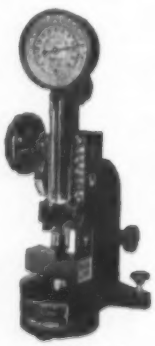
*Write for Brochure . . . Complete Information.*

**Oliver INSTRUMENT COMPANY**

1414 EAST MAUMEE · OLIVER OF ADRIAN · ADRIAN, MICHIGAN

FACE MILL GRINDERS · AUTOMATIC DRILL GRINDERS · DIE MAKING MACHINES
TOOL & CUTTER GRINDERS · DRILL POINT THINNERS · TEMPLATE TOOL GRINDERS





MODEL D

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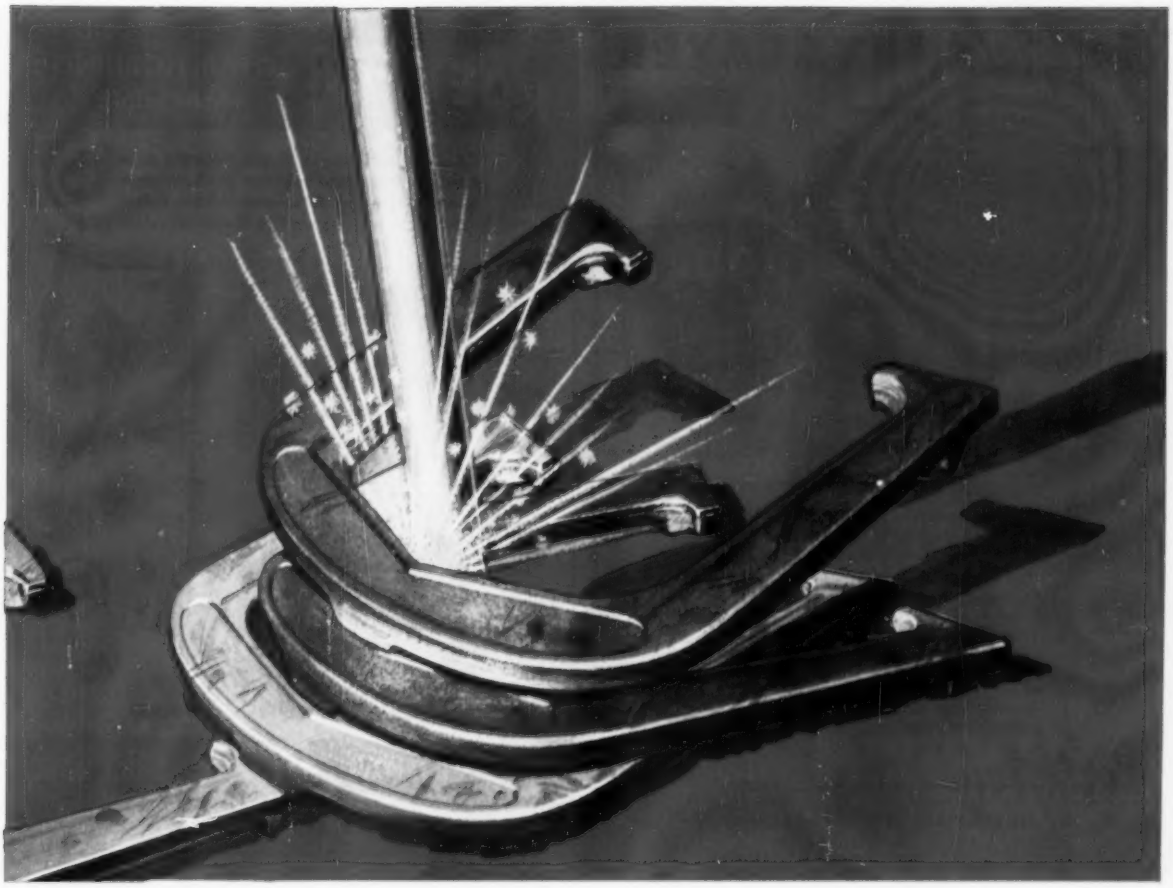

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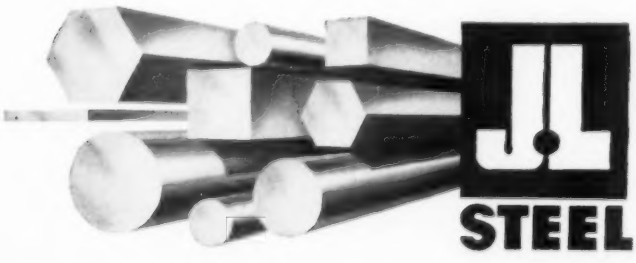


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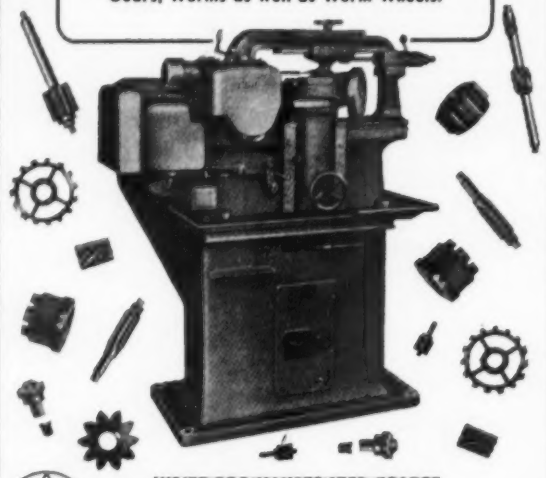

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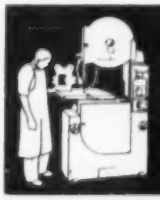

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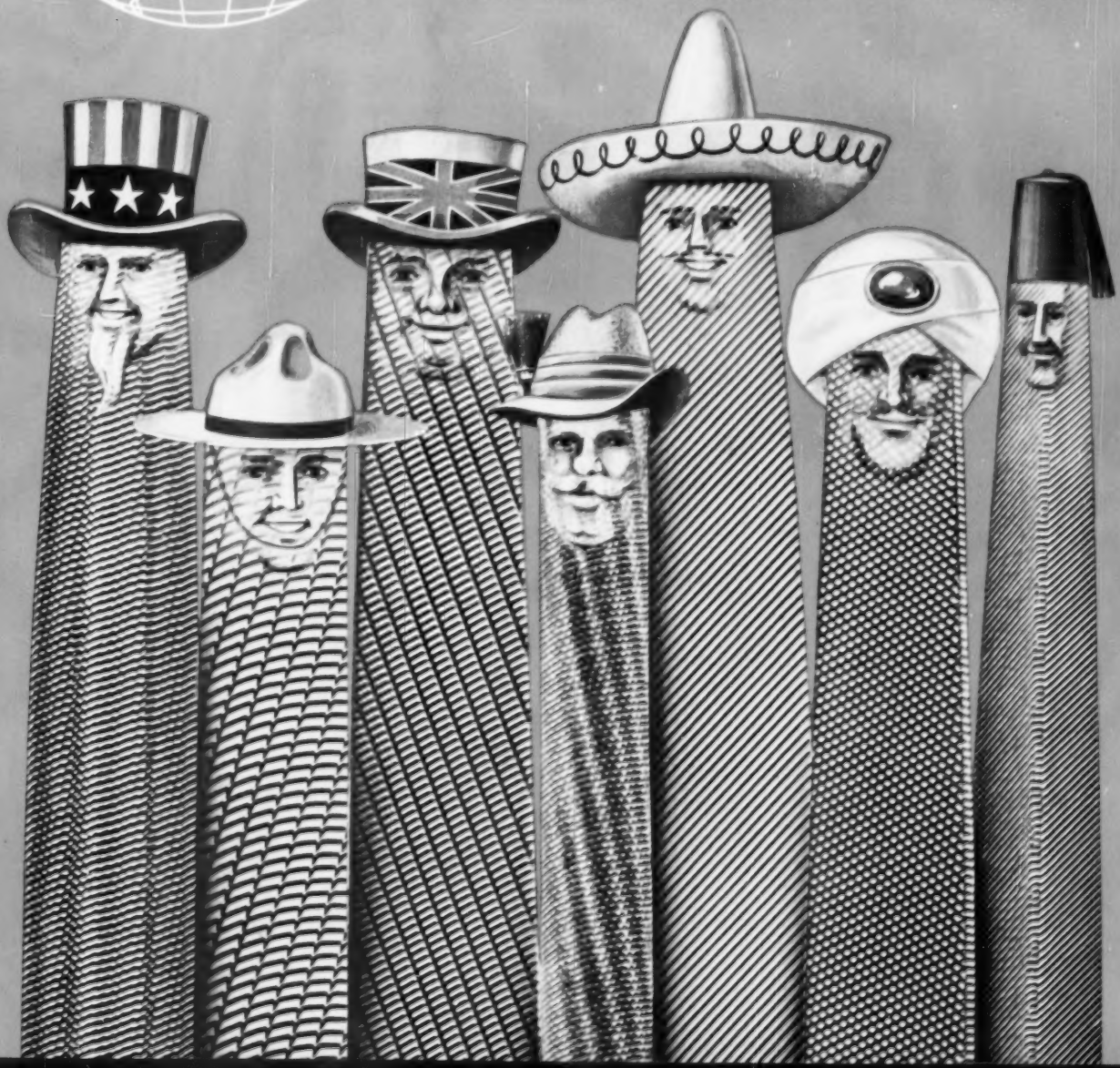

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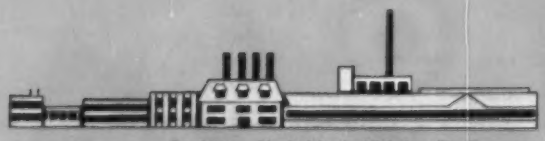

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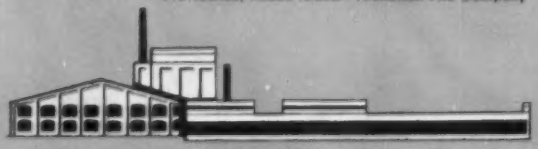

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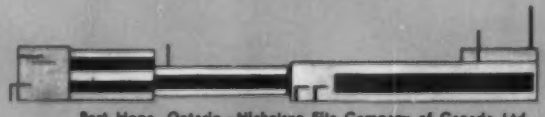

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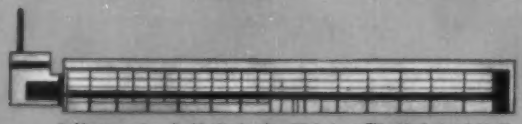

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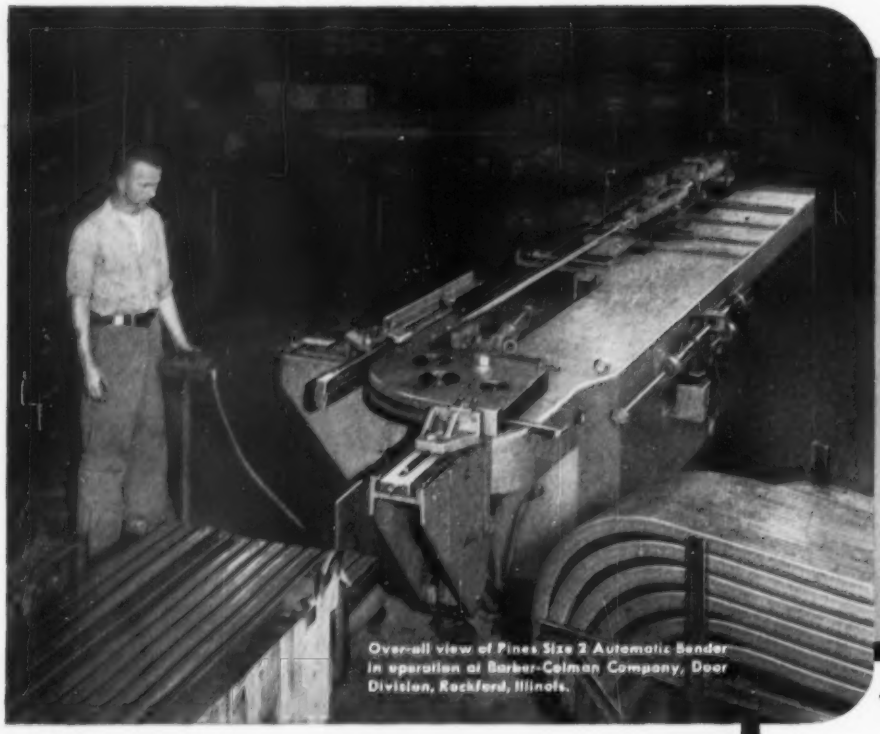
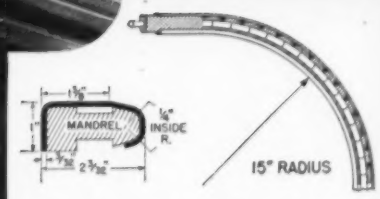


Over-all view of Pines Size 2 Automatic Bender in operation at Barber-Colman Company, Door Division, Rockford, Illinois.

# Steel Channel Costs Cut 15% AT BARBER-COLMAN CO.




Position of mandrel and workpiece for making R.H. tracks.

L.H. track is formed with opening up.

## PINES AUTOMATIC BENDER

**BOTH L.H. AND R.H. BENDS PRODUCED WITH SAME TOOLING**

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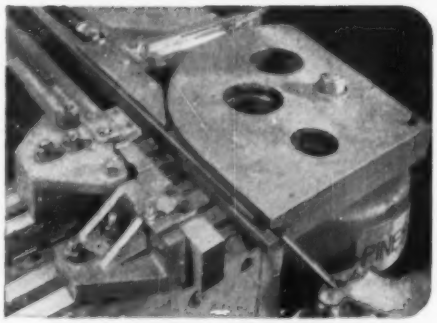

● Closeup of tooling used for making 90° bend for right-hand track. Flexible mandrel, inserted in channel, insures smooth, wrinkle-free bends. Bending arm speed is 6.0 r.p.m.

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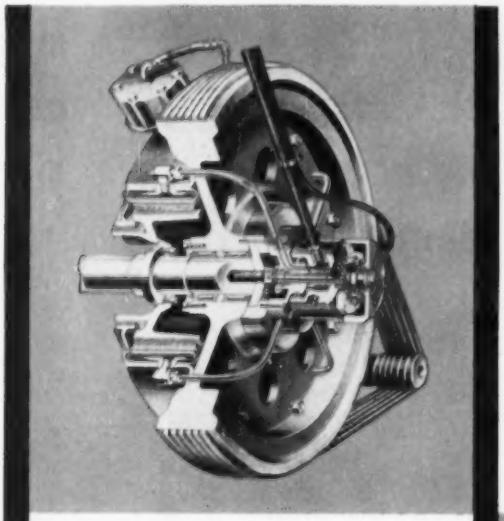

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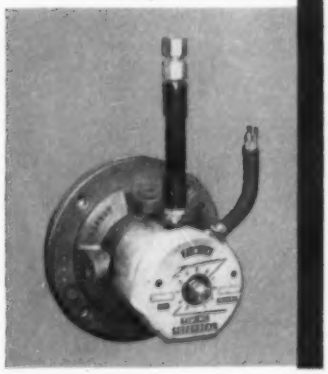

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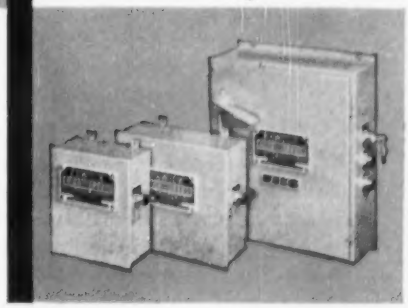

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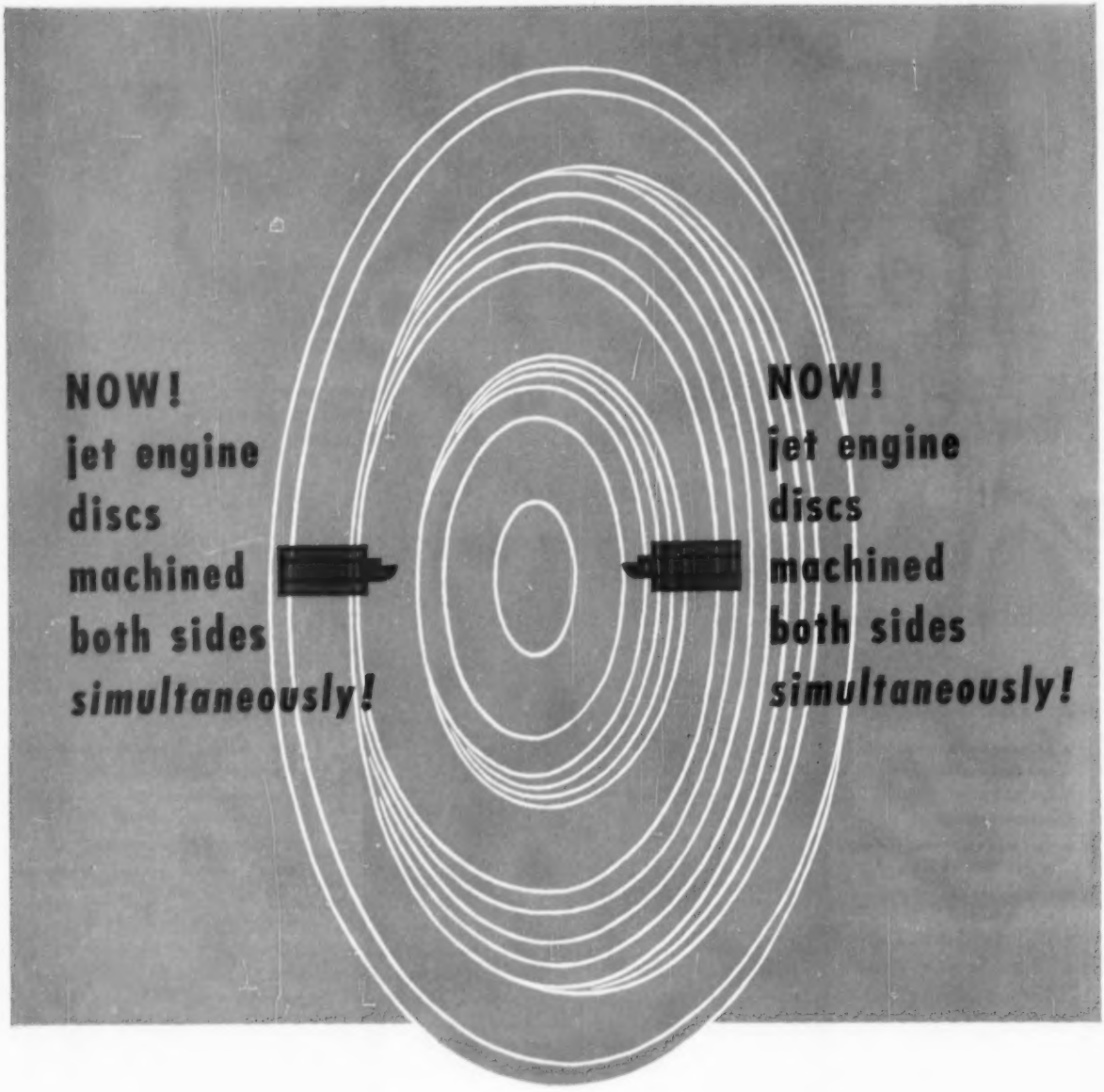


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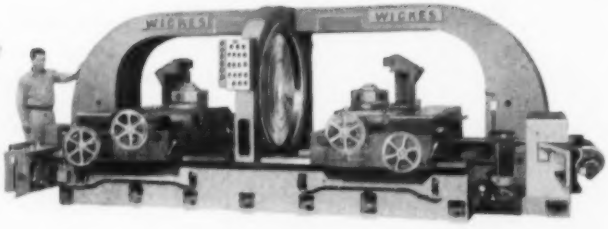


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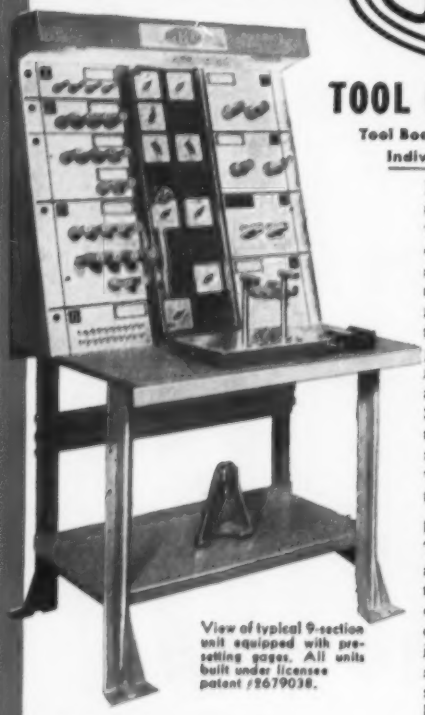

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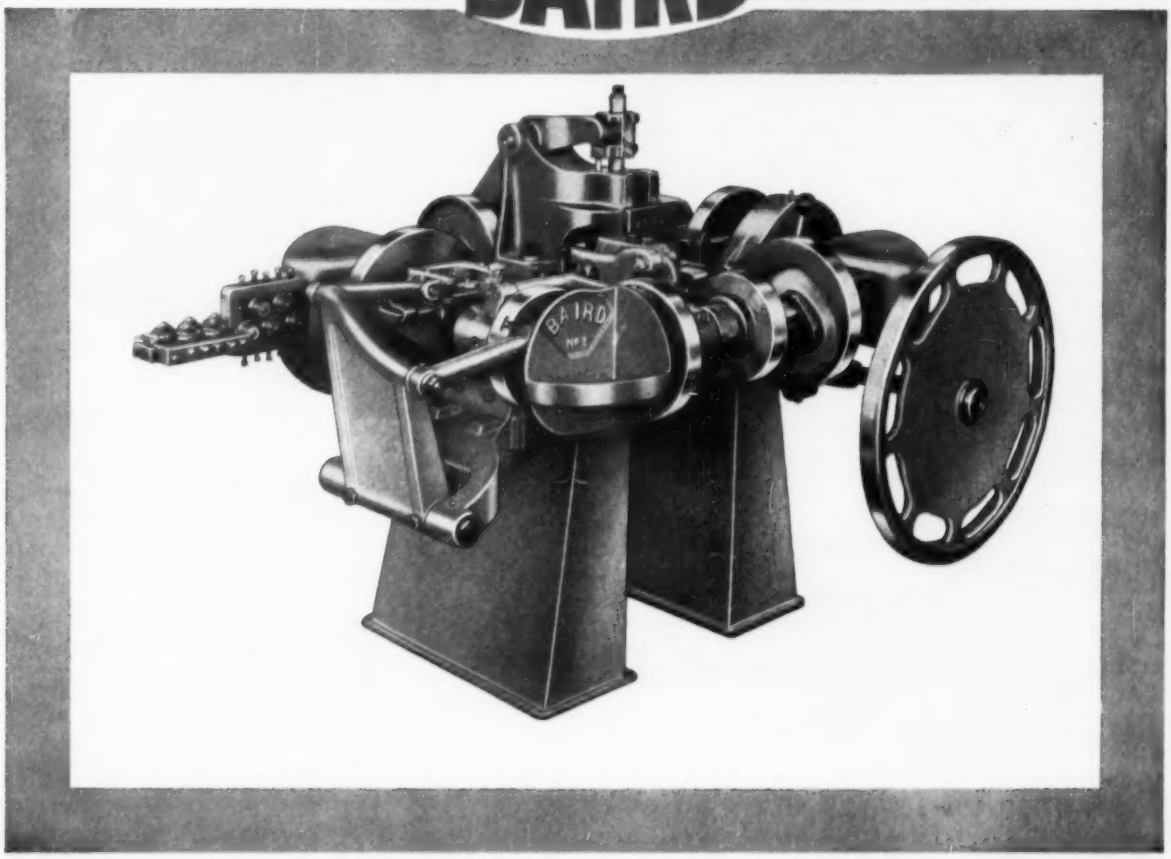
THE old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."

# ...ask BAIRD about it

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The "hidden bargain" is the cost-reduction know-how that goes along with every machine sold.

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With such a reservoir of past practical experience to draw upon, it's always good business to "ask Baird about it" when a four-slide application is being considered. Our range of standard automatic wire forming machines is complete, from the "bench top" No. 00 (400 lbs.) to the "room size" No. 8 (12,000 lbs.) . . . also two standard sizes of ribbon metal forming machines. Bulletin on request. Write Dept. AM.

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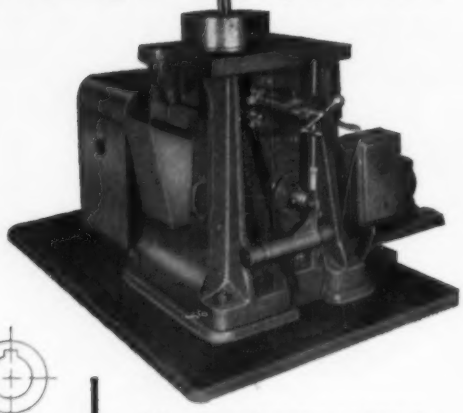
first in silicones

# M&M giant keyseaters



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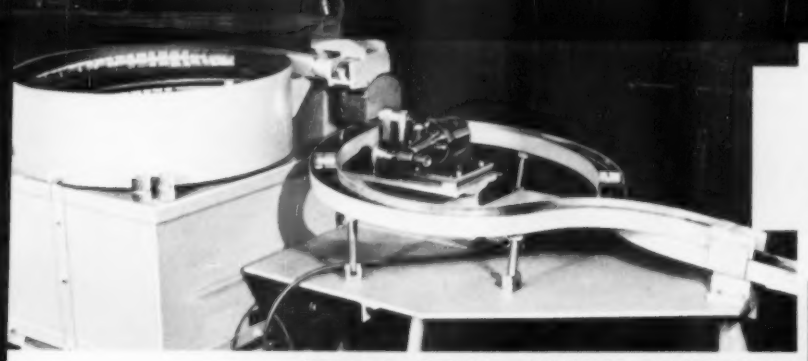
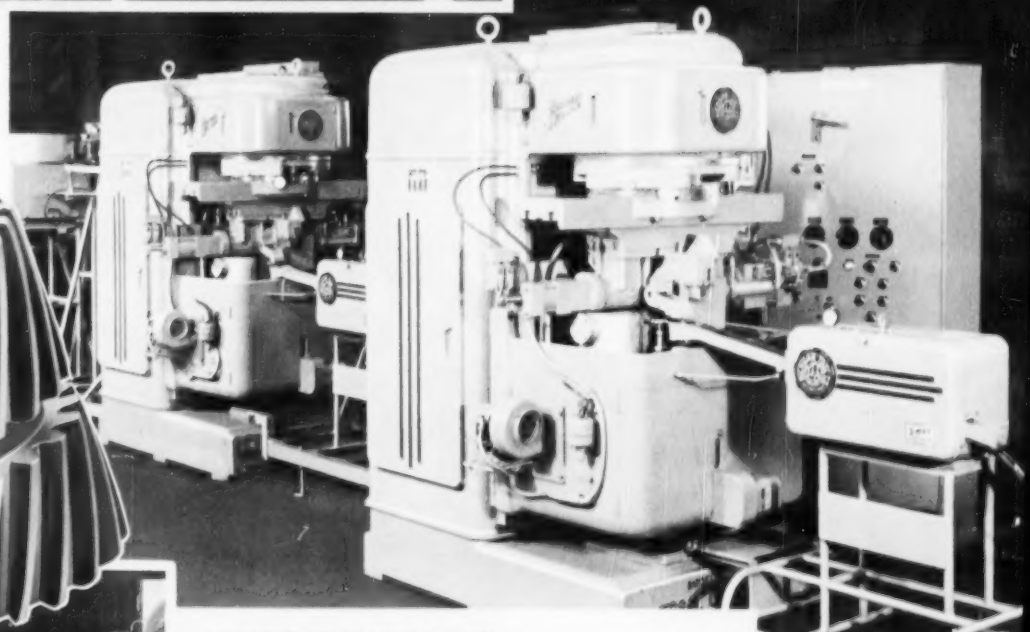
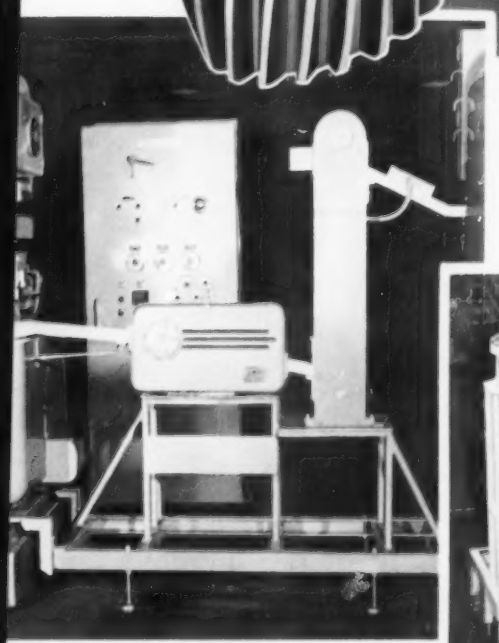


*This Month's*

# GEAR PIX



**CYBERNETIC SHAVING.** The double track from the loader at the top makes sure that the double gear is right-end-to as it goes into the first shaver. Each shaver has a controlling 3-WAY Michigan gear-classifier to accept or reject shaved gears before heat-treat and to automatically re-set machines when necessary. Elevator (left) re-loads gear into shaver #2.



**FULLY AUTOMATIC SOUND TESTING** follows heat-treat. These Michigan speeders (right) with tunable electronic audio-pickup eliminate variable human element in sound testing. Can be set to reject gears for excess noise in any desired pre-selected frequency band.

**MICHIGAN TOOL COMPANY**

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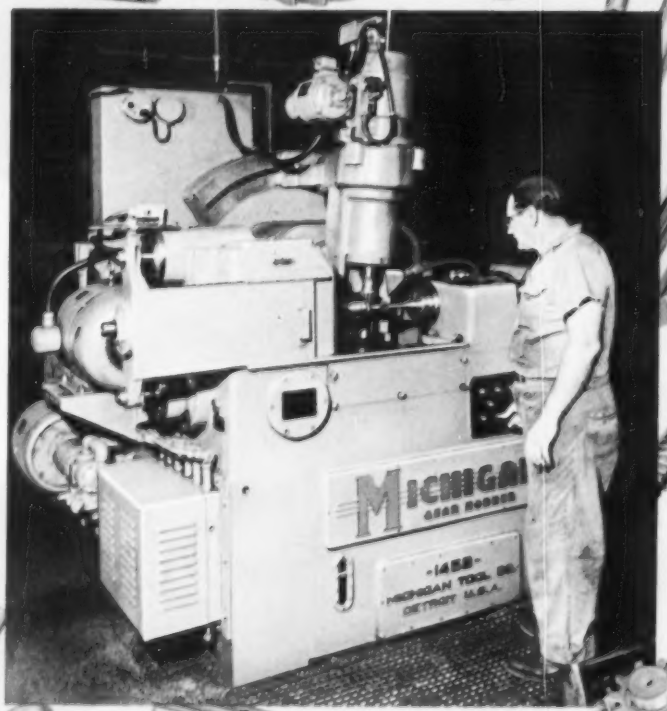
*This Month's*

# GEAR PIX




## 105 PARTS HOBBED ON JUST 3

Ultra-Speed hobbers regularly by a major lift-truck producer. Shows how high production machines can be used effectively for shorter runs. Hobbing is mostly at 250 sfpm (SAE4185) with far longer hob life and number of parts per grind. Change-over averages about 1½ hrs. (same as previously).

**MICHIGAN TOOL COMPANY**

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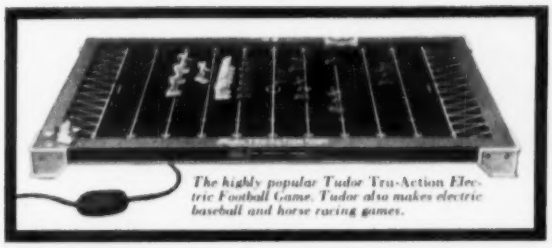
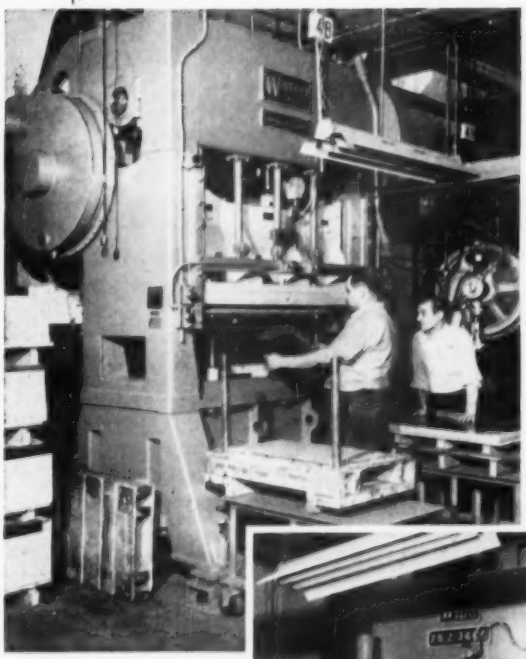
*IN CANADA: COLONIAL TOOL CO., LTD.*



*The highly popular Tudor Tru-Action Electric Football Game. Tudor also makes electric baseball and horse racing games.*

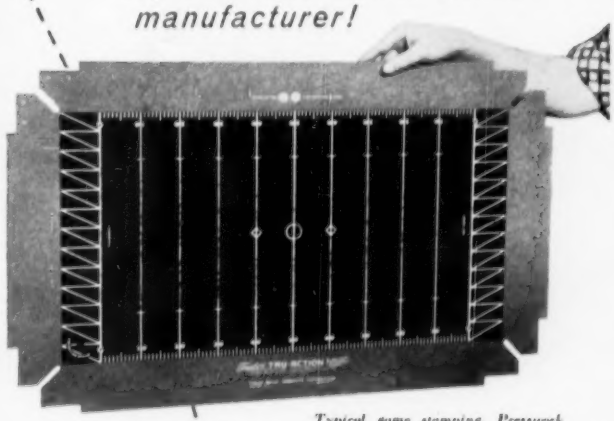
# "Warco's a winner!"

*says leading metal game manufacturer!*

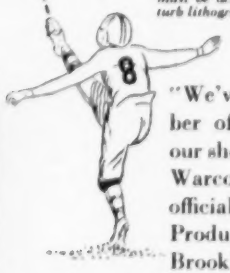


*Press Foreman Andrew Harris watches as press operator Andrew Amodeo operates 100-ton Warco Crank Press.*

*Salvatore Cordero puts flanges on stamping with Warco 75-ton Crank Gap Press.*



*Typical game stamping. Pressmark must be accurate, clean and not disturb lithography.*



"We've tried quite a number of different presses in our shop—and in our books, Warco is a winner," say officials of the Tudor Metals Products Corporation of Brooklyn, N. Y., one of the nation's leading manufacturers of metal games.

"Clean and neat of design, they perform with businesslike efficiency, with a minimum of maintenance. We like what we have seen, and certainly must give them an inside track when considering new press equipment."

If you haven't as yet talked with a Warco user, why not let us put you in touch with one in your area. We know he'll convince you that Warco will win for you, too.

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Warco® PRESSES

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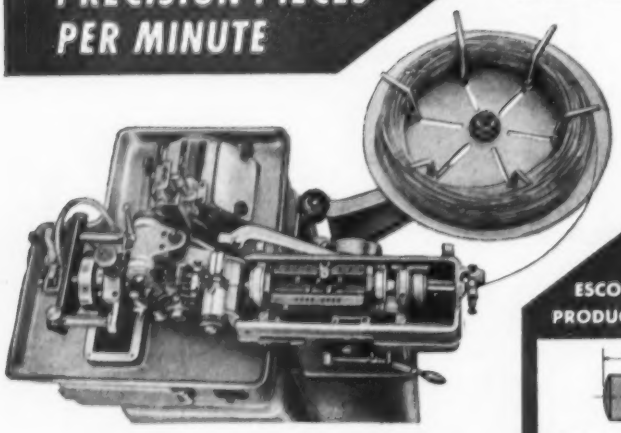
## GET UP TO 100 SMALL PRECISION PIECES PER MINUTE

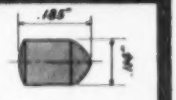
Below: ESCO ROTOMATIC DS-2 with optional wire-straightening attachment



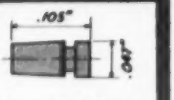
### PARTS UP TO 5/32" DIA. X 1" LONG MACHINED AS CLOSE AS ± .00025" FROM COILS OR BARS

A Swiss automatic form-turning and cut-off machine with optional wire-straightening attachment—you get high-speed production from coils or bars of any length. Coil-feeding speeds and economizes your operation by eliminating bar ends and bar loading time. Machining is done by two cutting tools mounted in a cam controlled tool head. The tool head rotates around material which is fed, guided, and clamped by a collet and a guide bushing. Machined parts are smooth, straight and *entirely burr-free* when they are delivered to the tray *separate from the chips.*

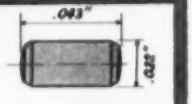
**TYPICAL ESCO ROTOMATIC PRODUCTION RATES**



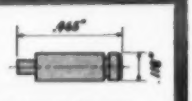

100/min.–brass




63/min.–nickel-silver




50/min.–nickel




10/min.–mild steel

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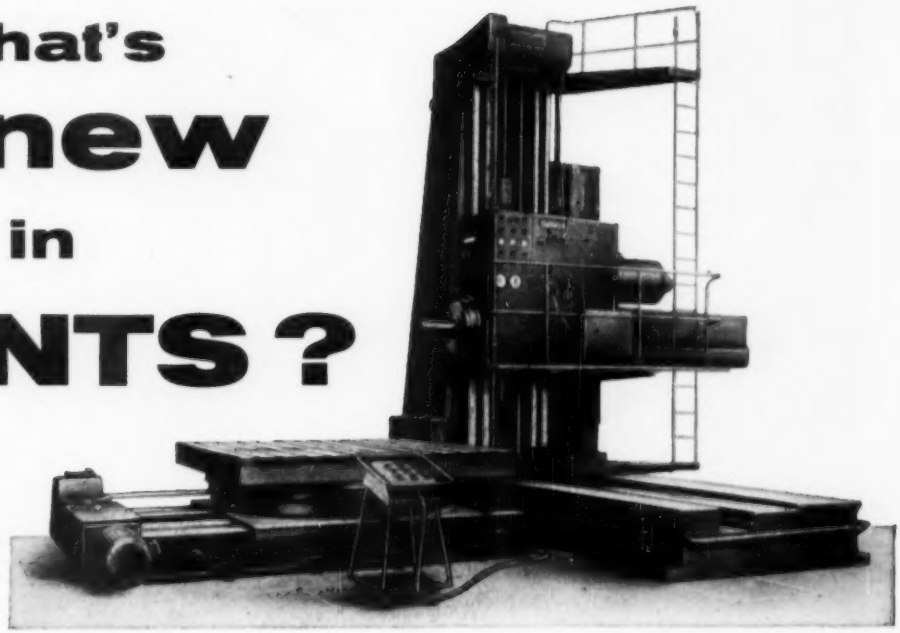

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**This 23 ft. SCHIESS model K vertical boring mill . . .**

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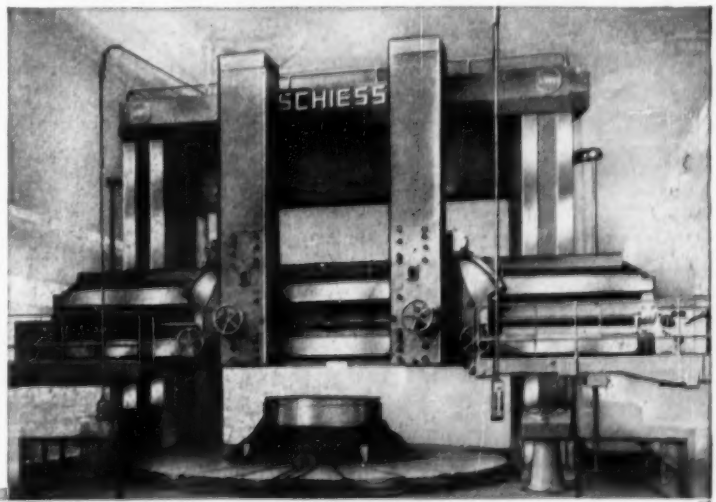


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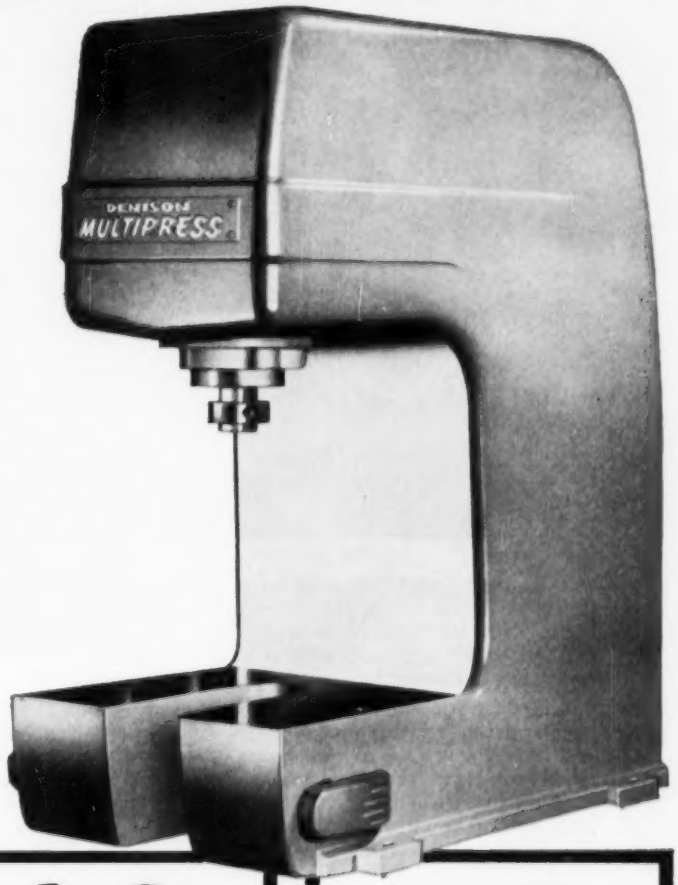


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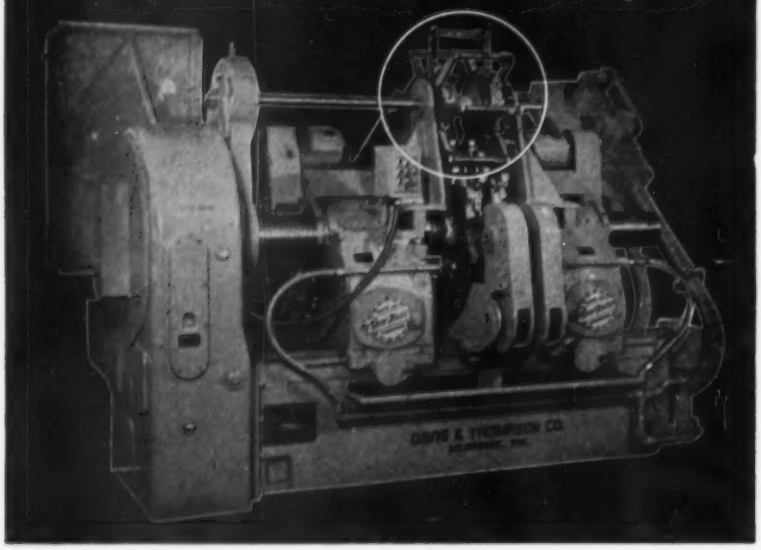

This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

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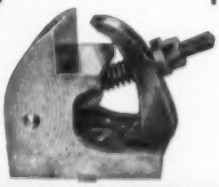

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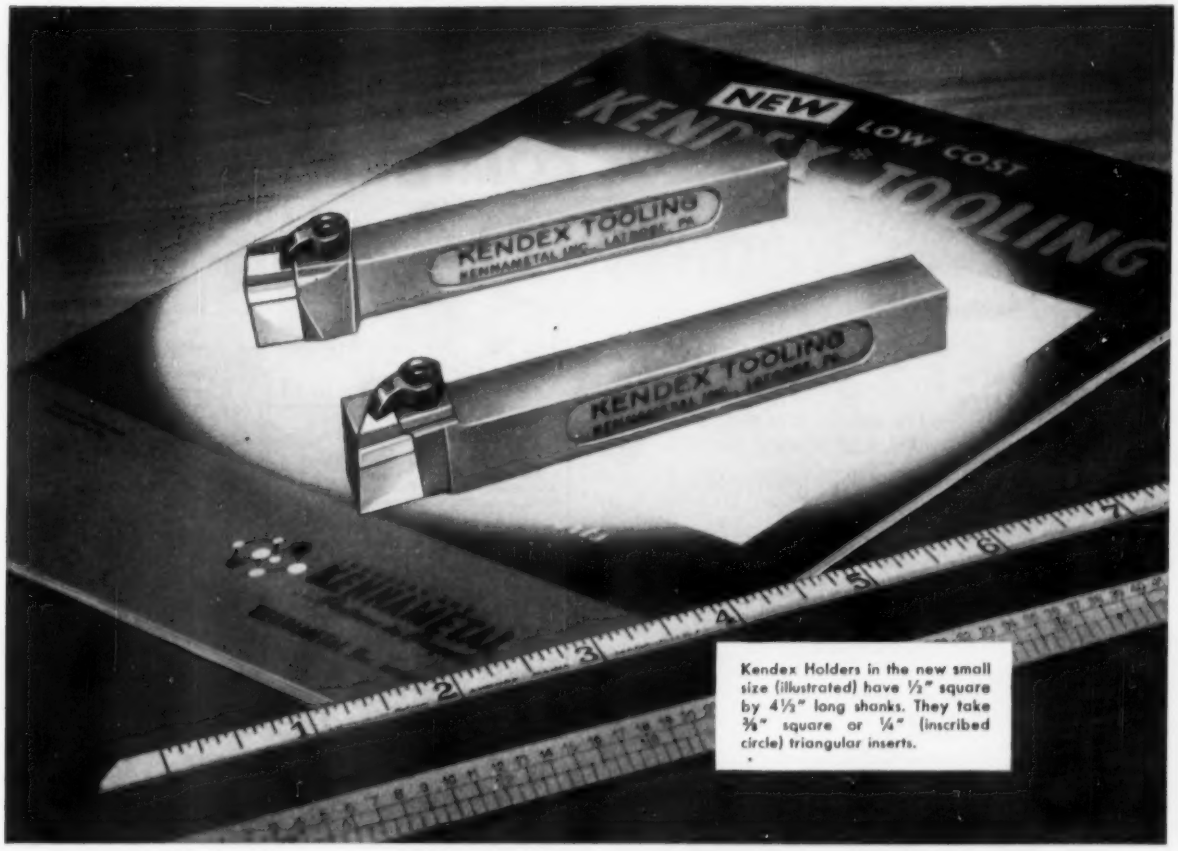


Kendex Holders in the new small size (illustrated) have ½" square by 4½" long shanks. They take ⅜" square or ¼" (inscribed circle) triangular inserts.

# NOW, small Kendex* Button Tools with turnover "throw-away" inserts

## ...for light machining on high production operations
## ...especially useful for boring operations

Another variation of the popular Kendex Tooling is now available. This is the new ½" Kendex Holder, available in four styles, for use with triangular or square Kennametal* "turn-over" button inserts . . . making available small tools with the many advantages and economies of the Kendex principle:

- grinding is eliminated
- inserts are indexed quickly to each new cutting edge
- machine downtime is reduced to a minimum
- production is increased

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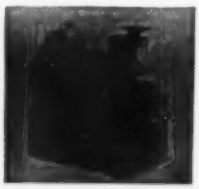

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## 7 Tricks of the Trade in Jig Grinding Small Holes

*The following tricks of the trade will prove helpful in jig grinding small holes with a diamond-charged mandrel:*

**1.** Uniformly graded diamond powder should be used for charging mandrels. Holes from minimum (1/64") to about 3/32" in diameter should be roughed and finished with 80-100 grit powder. Larger holes may be roughed somewhat more rapidly with a coarser grade, 60-80 grit.

**2.** Avoid bellmouth by preventing the mandrel from leaving the hole at either end.

**3.** Since a freshly charged mandrel will cut much more rapidly than a worn one, avoid introducing a freshly charged tool as a hole nears size, Fig. 1.

**4.** Do not permit the uncharged *shank* of a mandrel to contact the surface being ground. Frictional heat will burn both the work and the mandrel. The former, partially annealed at point of such contact, will charge with diamond sut and probably be ruined.

**5.** It is generally more economical and efficient to consider mandrels as expendable and make a new one for each job. Since the cost is only a few cents, use of an old one, or even the time spent trying to match one to requirements, is hardly justified.

**6.** Because mandrels cannot be trued with a diamond, it is necessary to measure both the top and bottom of a hole while grinding, in order to avoid a ridge.

**7.** In view of point 6, it is advisable to set the work up on parallels of sufficient height to enable measurement from beneath the workpiece, Fig. 2.

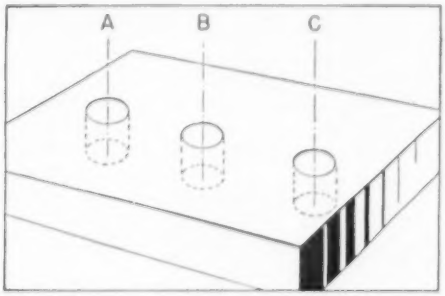


*Fig. 1. In grinding three holes to size, A and B are roughed to within .001"–.002", and C within about .005". Using a freshly charged mandrel, C is finished to size, thereby breaking down the high points on the tool. A and B may now be safely ground to size.*

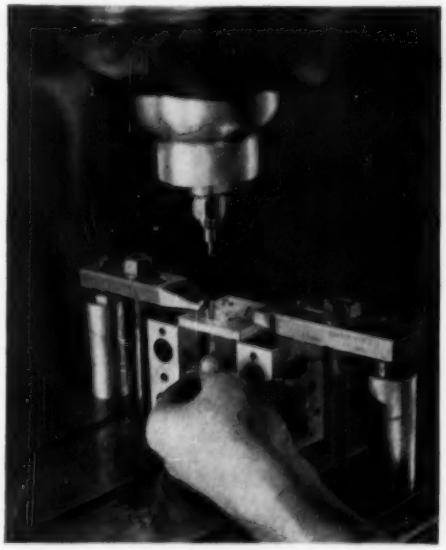

*Fig. 2. Workpiece is mounted high enough to permit measuring bottom as well as top of hole.*

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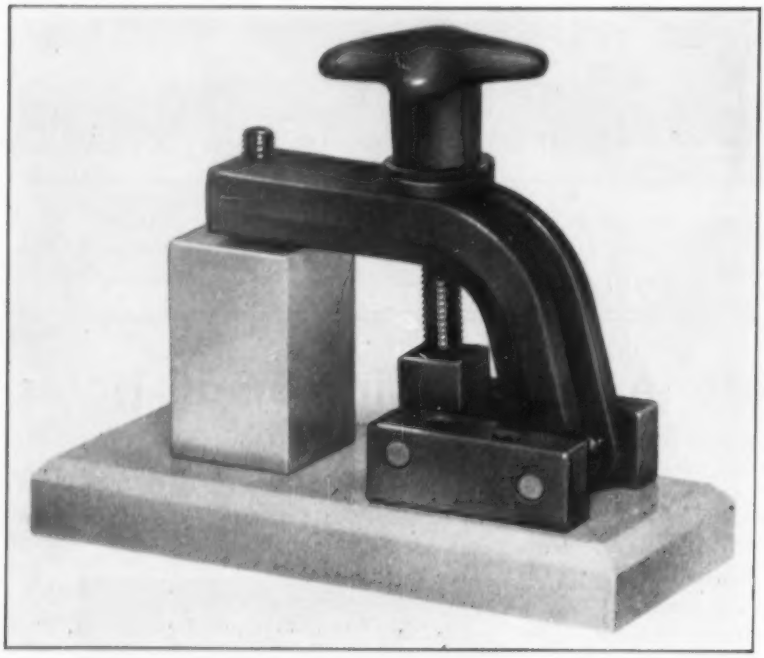

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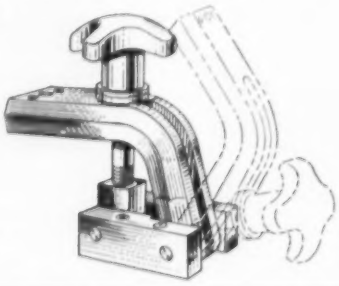

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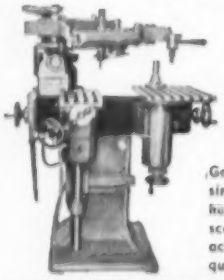

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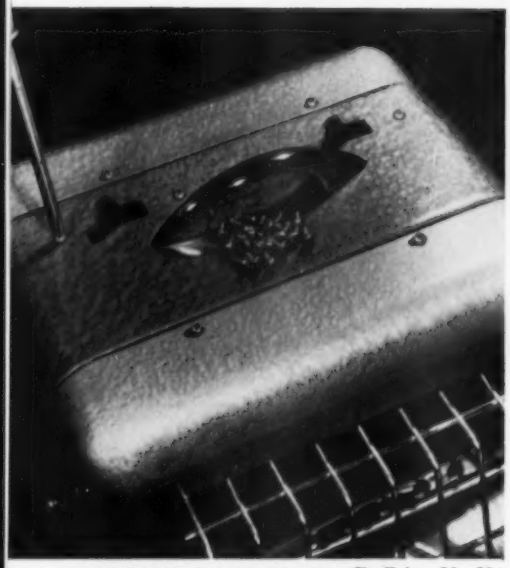

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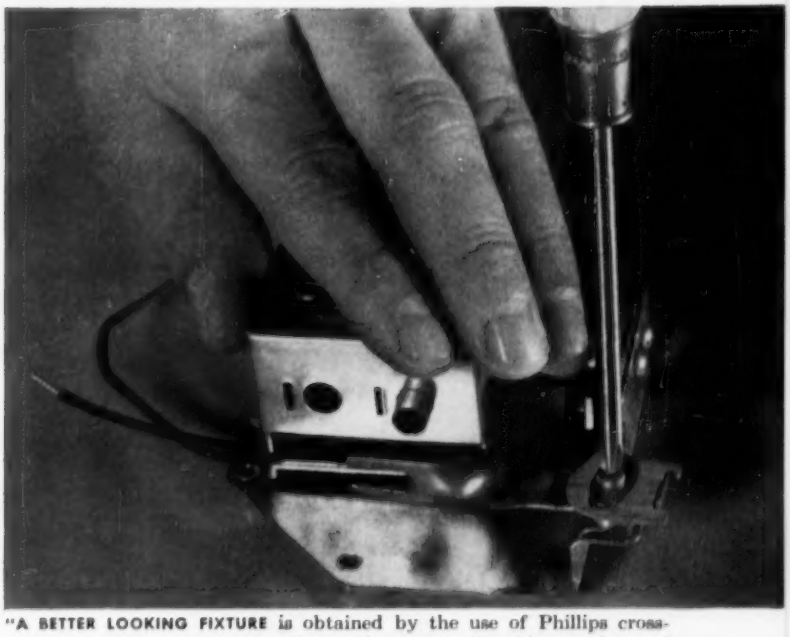

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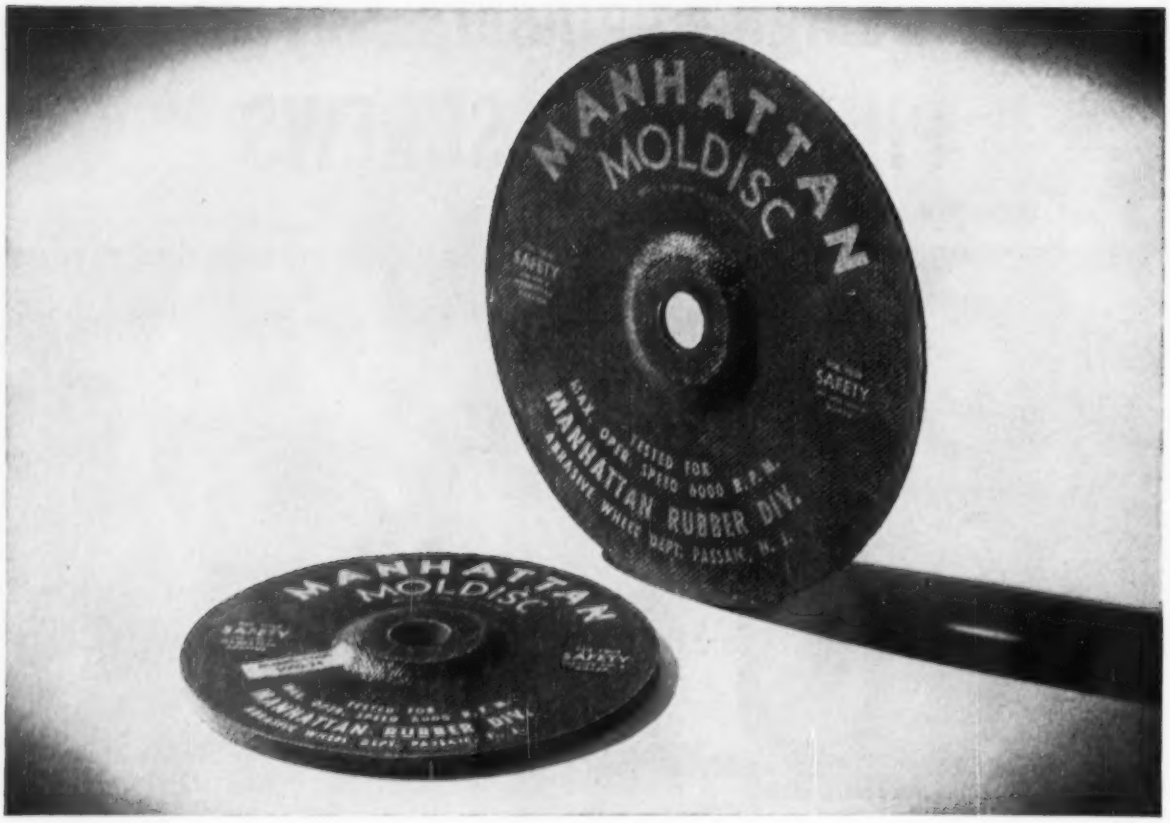


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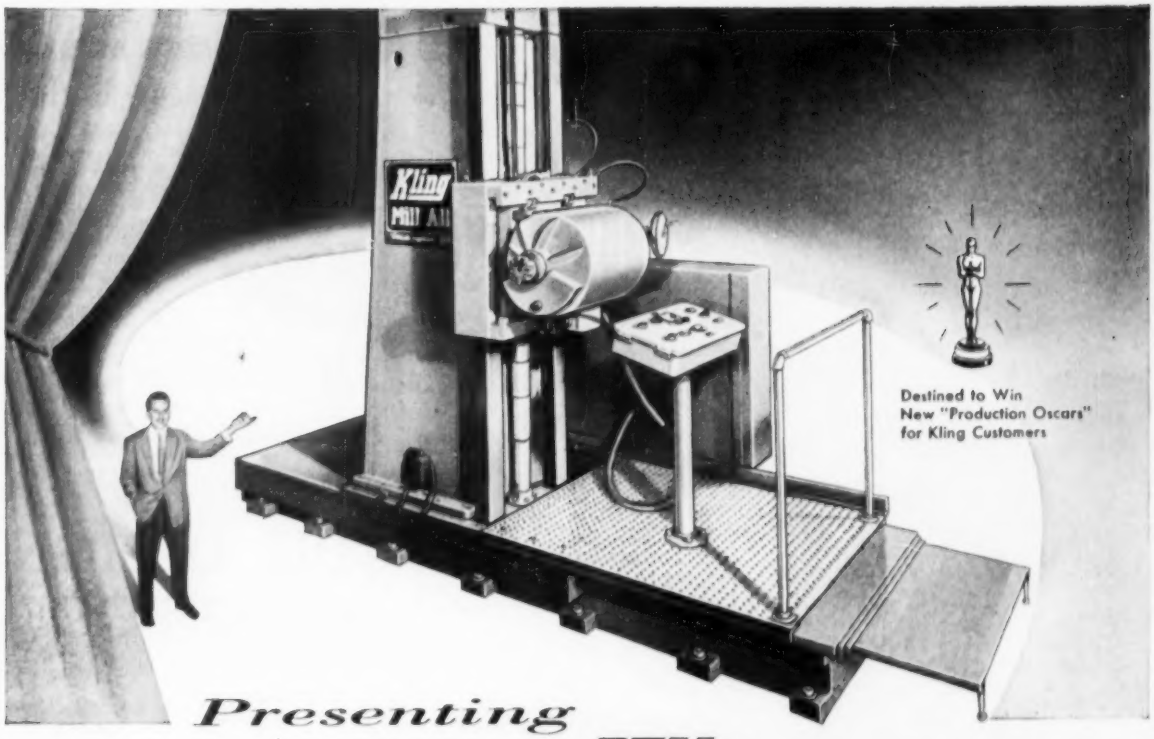


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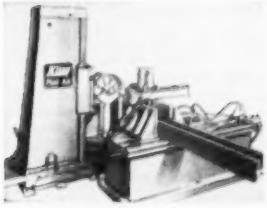

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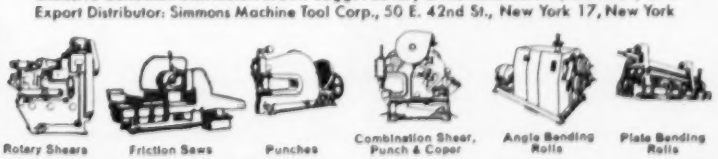

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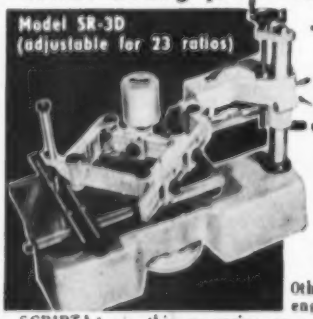


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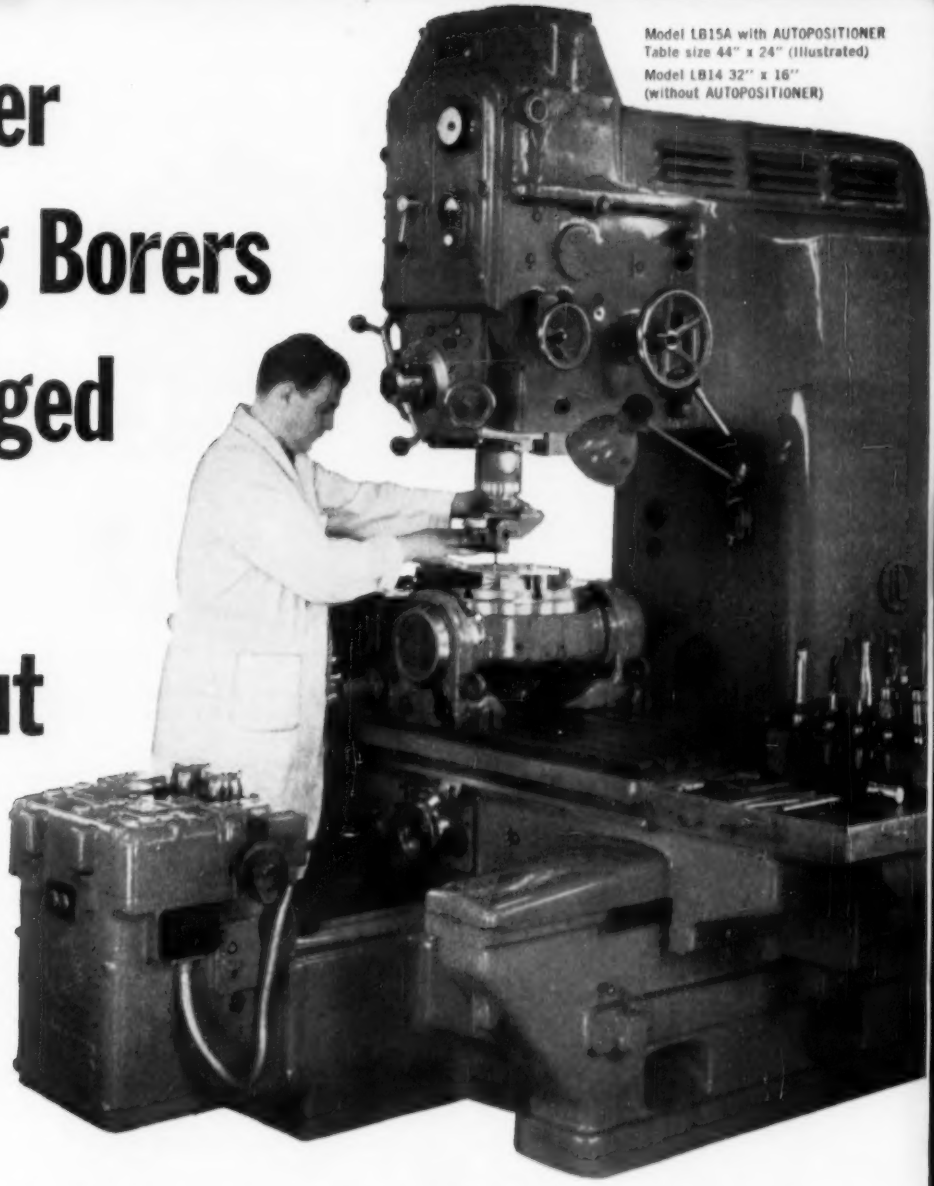

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# Gaging . . .

## the Surplus Machinery Market

**Looks like there's no place to go but up from here on out**—another way of saying the summer slump is on in full force. But to a man, the selfsame dealers who report business today is anywhere from "quiet" to downright "lousy," are agreed that business should be good this fall and winter. It might even, they think, hit levels as good as those at the beginning of this year.

**The current slow season is just the normal one** you get every year along about this time, with vacations and general hot-weather lackadaisicalness calling the shots, rather than any uncertainties the recent long steel strike may have developed. Anyway, most dealers seem to feel that Labor Day marked the turning point when business generally settled down to work, and when machine tool buyers started buying again in earnest.

**Backlogs of machines on order at surplus dealers right now** are as big or bigger than they've been at any time in the last couple of years. But an order in the pocket today is a far cry from a completed sale—it's getting tougher and tougher to pick up good used machinery. But when the new machines come rolling out of the builders' plants, and it shouldn't be too long now, you can look for the first cracks in the "not for sale" signs.

**Some of the business slowdown,** in the big metalworking centers like Detroit, Cleveland and Chicago, can be attributed to the slowness with which orders from some automakers are filtering into stamping plants. Maybe it's because the auto boys, who got their fingers badly burned in the '56 model year, are shopping around more than usual, but two large Midwestern stamping plants report they're out of work and may even have to shut down until their anticipated auto orders come in. They've been told, as has the public in general, that the automakers are looking forward to a banner year, but the orders just haven't come in yet.

**The aircraft industry,** on the other hand, is bolstering used machinery sales clear across the country. Most of the inquiries are pouring in from West Coast dealers, who just can't keep up with California's mushrooming aircraft and electronics industry demands. While most requests are dealer-to-dealer ones, a big Midwestern dealer reports he's holding off the usual summer slump by filling direct orders from general metalworking plants on the West Coast—not aircraft or electronics plants.

**This particular dealer** is running a sort of against-the-wind operation in that he says he's finding it easier to get hold of topnotch used machines now than he did several months back. He's doing much better than his competitors too, he says. Possibly it's because his firm will handle nothing but top-quality machines of recent vintage.

**MDNA notes:** the Association will lay the groundwork of a public relations campaign for the industry sometime this month, when committee head Richard Nathans presents a proposed program to MDNA's Board of Directors for approval . . . "Where should we have our 1957 Convention?" survey of member dealers has deadlocked at 48 votes for Grossinger's resort in upstate New York, and 48 votes for somewhere in New York City . . . Work is going on under chairman Frank Laurens to develop MDNA standard sheets suitable for a basis of quoting and inspections.


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B & S #00G Hi-Speed Swing Stop.
B & S #00G Hi-Speed Screw Threader, 1951.
GREENLEE 1" 6-spindle, well tooled.
CONE 3½" 4-spindle.
NAT ACME RB 3½" 6-spindle, 1953.
NAT ACME R4 2¼" 4-spindle.

**DRILLS**

AVEY 12" O.H. 8-Spindle Sensitive.
AVEY 12" O.H. 2-Spindle Type M-A6.
CANEDY-OTTO 21" Box Col. 2-Spindle Upright.
CANEDY-OTTO 21" Rd. Col. Upright.
CANEDY-OTTO 4'11" Col. Radial, 1947.
BARNES #262 Sliding Head Upright #4 Morse.

**GEAR EQUIPMENT**

FELLOWS 8M Red Liner Gear Checker.
GLEASON 12" St. Bevel 2-Tool Generator.
FELLOWS 64A High Speed Gear Shaper.
GLEASON 3" St. Bevel Generator.

**CYLINDRICAL GRINDER**

B & S #2 14 x 30 Universal.
CINN. 6 x 12 Model ER Plain, Cycle Infeed.
CINN. Model EA 6 x 30 Plain.
LANDIS 10 x 96 Type C Hyd. Plain.
B & S #12 Universal-Coolant.
NORTON 10 x 36 Type C-Semi Automatic, 1947.
NORTON 14 x 36 Type C Plain.

**LATHES**

LIPE Carbo Lathe 12 x 18 Cap., F & R Slides.
MONARCH 14 x 30 Model C Tool Room, T.A.
SEBASTIAN 16 x 36 Model B, T.A.
SUNDSTRAND Model 8 Automatic Lathe 15" Centers.
HEB OP 320 x 40" Hydr. Copying, 1952.
SOUTH BEND 16" x 10' Model 117G
LeBLOND 19/36 x 6'/10' Sliding Bed Gap

**MISCELLANEOUS**

INGERSOLL TYPE Milling Machine, 4 Heads 1940.
GRAY 36" x 36" x 12' Double Housing Planer, New 1942.
GORTON 8½" D Duplicator
THOMPSON Model 5L 12 x 16 x 60 Hydraulic
J & L #3 1½ 21¼ Sw. Ram Chucker
NEWALL #2 Jig Borer, 1947.
SIP Model 2C Jig Borer, Table 17¾" x 10½", Factory rescraped.

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No. 3B Edlund, 12" overhang

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No. 61 FELLOWS Gear Shaper (older)
No. 61A FELLOWS Gear Shaper (late)
No. 135 CLEVELAND AXLE Shaft Hobber
No. 368M GOULD & EBERHARDT 3-spindle Bevel Gear Cutter
No. 36B GOULD & EBERHARDT Automatic Gear Cutter (late)
No. 725 FELLOWS High Speed Gear Shaper
No. 12 GLEASON Straight Bevel Gear Roughor
No. 60SM GOULD & EBERHARDT 3-spindle Vertical Gear Cutter (nearly new)
Model "A" BARBER-COLMAN Hobber

### GRINDERS

No. 13 BROWN & SHARPE Grinder
No. 5 BRYANT Internal Hydraulic Hole Grinder (late)
No. 16-16 BRYANT Hydraulic Internal Hole Grinder (late)
No. 16-38 BRYANT Internal Hydraulic Hole Grinder (late)
No. 24P26 BRYANT Hydraulic Internal Hole Grinder (late)
No. 50 HEALD Internal Grinder (late)
6"x18" CINCINNATI Plain Cylindrical Grinder Type EA, saddle (rebuilt and ready)
10"x18" NORTON Semi-automatic Plain Cylindrical Grinder (late)
10"x48" LANDIS Plain Cylindrical Type C Grinder (late)
14"x72" Plain CINCINNATI Self-contained Grinder
14"x168" LANDIS type CH Plain Cylindrical Grinder (late)
16"x36" NORTON Type C (plunge) Cylindrical Grinder (late)
Model A3-16 ARTER Rotary Surface Grinder
No. 16A2 BLANCHARD Automatic Surface Grinder (excellent)
Model 76 RAP ROGERS Knife Grinder

### MILLERS

No. 4F K & T Plain Mill Motor-in-base Timken Spindle
No. 2A BROWN & SHARPE Univ. Horiz. (older but good)
No. 2A BROWN & SHARPE Univ. Horiz. vert. attachment (late)
No. 4 CINCINNATI HiPower Vert., Timken Spindle (late)
No. 4-48 CINCINNATI Hydro-Matic Duplex Mill

### PLANERS

36"x36"x26' CINCINNATI Double Housing Hypro Planer (reversing motor drive)

### TURRET LATHES

No. 5 GISHOLT Ram Type Hydraulic Pre-selector (late)
No. 1 CINCINNATI ACME Heavy Duty (good)
No. 1A WARNER & SWASEY Geared Head Way Type (older)
No. 2A WARNER & SWASEY Geared Head Way Type (older)
No. 2A WARNER & SWASEY Geared Head Way Type Serial 900,000 (1946)
No. 5D POTTER & JOHNSTON Geared Head Way Type (late)

### MISCELLANEOUS

14"x16' COULTER Automatic Screw Cutting Lathe (late type)
12" 8-Spindle BULLARD Mult-Au-Matic
6"x60" MODEL C PRATT & WHITNEY Thread Mill (rebuilt and ready)
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6" RHODES Shaper (good)
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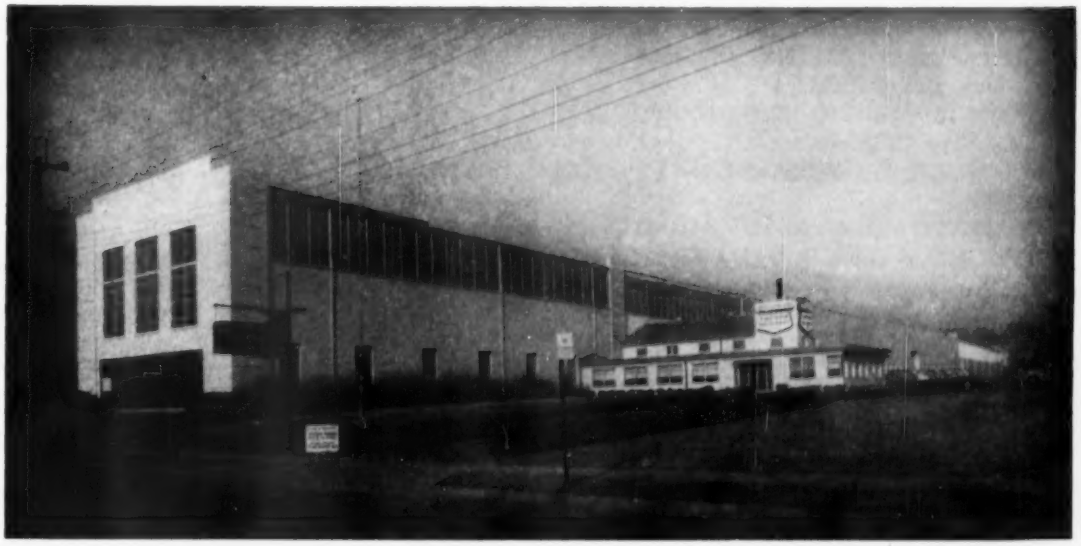

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No. 201½ Barnes Single Sp. Self-Oiling All Geared Drill & Tapper, 1943
No. 242 Barnes Single Sp. Self-Oiling All Geared Drill & Tapper
No. 417 Baker, m.d.
No. 513 Baker, m.d.

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No. 12 Fellows Gear Shaving Machine, m.d., late
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No. 7, 7A Fellows Gear Shapers, belted m.d.
No. 10 Fellows Gear Finishing Machine, m.d.
No. 6I Fellows, belted motor drive
No. 6I Fellows, gear box, m.d.
No. 6IA Fellows, m.d., latest type
No. 64B Fellows, m.d.
No. 64SA Fellows, m.d.
No. 64SA3 Fellows, vee belt drive
No. 72 Fellows High Speed Spur Gear Shaper, m.d.
No. 75 Fellows High Speed, m.d.
No. 75A Fellows, H.S. Spur & Helical Gear Shaper, m.d.
No. 712 Fellows, m.d.

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No. 36 Gould & Eberhardt Bevel & Spur Gear Roughr, m.d.
Gleason Spiral Bevel Gear Roughr, m.d.
No. 36M Gould & Eberhardt Spur Gear Cutter
No. 4B Fellows Gear Burnisher
No. 8B Fellows Gear Burnisher
Cincinnati Gear Burnisher, m.d.
3" Gleason Gear Generator, m.d.
8" Gleason Gear Generator, m.d.
11" Gleason Gear Generator, m.d.
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No. 4—48" Brown & Sharpe, m.d.
No. 13 Brown & Sharpe Auto. Spur & Bevel, m.d.

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No. 13LS Fellows Gear Lapper, m.d.
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GG31 Gear Grinding Machine, Internal Gear & Spline Grinder, m.d.
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No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman, Double Overarm, m.d.
No. 12 Barber-Colman, Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d., Spur & Spiral
No. 130 Cleveland Rigid Hobber
No. 48H Gould & Eberhardt Spur & Helical, m.d.
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No. 471 Michigan Tool Co. Hob, Reamer & Gear Checker

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#44 Excello Double End
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No. 50 Heald, m.d., 1944

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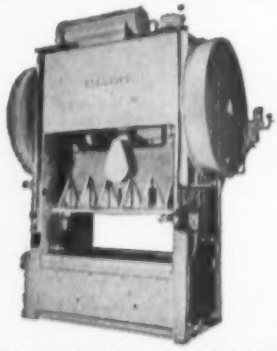

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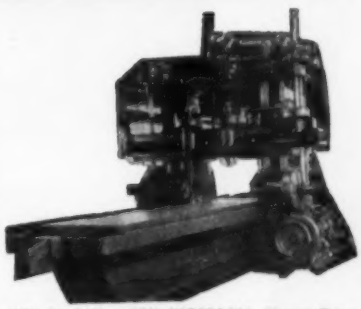

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**Bliss 200 T Cap. S.S.S.C.B. Grd. Press 8" Str. #77**
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**Heald #22 Rot. Surf. Grinder 12" chuck 1942.**
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**Hendey 16"x8' bed Q.C.G. Lathe 1930.**
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#49 Heald Boremastic, new 1944

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1 spdl, 20" sw, #2LMS L-G., 1945
1 spdl, 24" sw, #2MA6 Avey, new 1942
1 spdl, 26" sw, #4M8 L-G, hydraulic
2 spdl, 24" sw, #3 Avey, AC MD
3 spdl, 20" sw, #2LMS L-G, 1942
3 spdl, 24" sw, #3M8 L-G, new 1943
4 spdl, 14" sw, #2LM8 L-G, new 1942
6 spdl, 20" sw, #1LM8 L-G, new 1943
#314-A Baker Univ. H.D., 1943
16 spdl, Fox #K60H, #3 taper, 1944

### BORING MACHINES

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#49 Heald Boremastic, new 1944

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3"x12" #5 B&S, Rap. Trav., 1948
3"x18" #5 B&S, Rap. Trav. 1942
4"x18" No. 4H Landis 1943
6"x18" Norton Type C, new 1943
10"x18" Norton Type C, new 1943
10"x36" Norton Type C, new 1942
10"x48" Norton Type C, new 1942
10"x48" Cinn. (Sw. 28") 1943
10"x50" Hill-Clarke, AC Mot. Dr.
10"x72" Hill-Clarke, AC Mot. Dr.
10"x96" Hill-Clarke, AC Mot. Dr.
10"-20"x36" Norton, angular wheel
16"x72" Hill-Clarke, AC Mot. Dr.
16"x26"x72" Norton, AC MD, 1941
42"x72" Norton, extras, new 1947
18"x96" Hill-Clarke, AC Mot. Dr.
18"x120" Norton, AC MD.
24"x264" Norton, AC MD, Rebuilt
26"-32" Gap x 114" Norton Pl. Cyl.
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#16A-16 Bryant Internal, new 1943
#16-36 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A3 Heald Int. Sizematic, 1944
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#214 Besly Double End Disc. 1940
#3-B Abrasive Surf, 8"x24" Table 1943
#18-30" Blanchard Rot. Surf.

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16ML-16"x36" LeBlond Auto.
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12"x30" Hendey Lathe, Taper Att.
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12"x42" Fay Automatic
14"x36" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
24"x42" Fay Auto. AC MD
36"x36" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x36", 1943
120"x96" or N-B-P, ser. 3380
#5W Cinn Acme Univ. Turret
#4 Gisholt Univ. Tur. A.C.&B.F.
#3H-10 Libby H.D. Tur. 1942
#4A W&S Turret, new 1944
42"U Fastermatic, tur. 32" sw, 1944
#8D Potter & Johnston, new 1941

### MILLERS

54"x30"x16 Ingersoll Hiab, 1934
54"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical Rot.
#M-24 K&T Prod. 1941
#0V Davis & Thompson Vert., 1944
3½" Bar Cinn.-Gilbert Table Type HHM
#12-B Pratt & Whitney Profilers
10"x60" P&W Mod. B Thread Mill
#LT 6"x72" L B Thread
2CT L-B Thread Mill new 1942
No 2 Cinn. Univ. Hi-Power
#36 Van Norman, Rebuilt, 1941
#1-18 Van Norman Prod. 1942
1848-S K&T Simplex

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36"x36"x12" Rockford Openside '42
60"x48"x27" American, 4 hds.
60"x48"x30' Hamilton, 4 heads

### MISCELLANEOUS

6" Goss & DeLeeuw 8 spdls. 1941
#306 Barnes Vert. Hone, new 1942
15 Ton Hyd American Press, 1946
#11HD 2 Hd. W&S Tapper, latest
#36HM G&E 2 Spdl. Bevel Gear
#61A Fellows Gr Shaper 18" cam
#HR8 Barber-Colman Sharp Mach
15 T Toledo Overhead Crane, 29½

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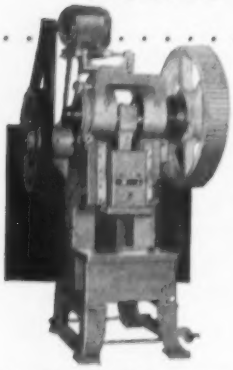

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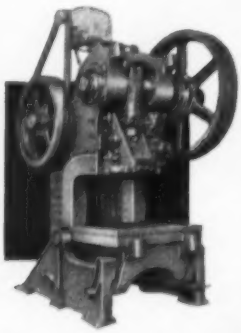

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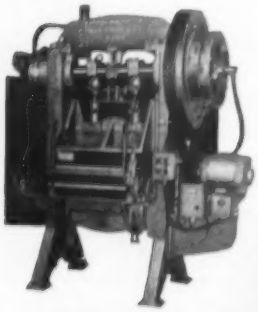

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THERE'S always a way. Remember the college that got a bequest of several hundred thousand dollars for a new girls' dormitory — which the will stipulated must be surrounded by a 20-ft wall. A smart trustee suggested the bequest be accepted and the dorm be built—with the wall in a 20-ft trench.

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ARE you lugging materials to and from a machine for a minor operation that should be done where the material is? Check facing to length, centering, cut off, plain grinding. If volume is large, it may be cheaper to move the machine once and for all rather than moving the material continuously.

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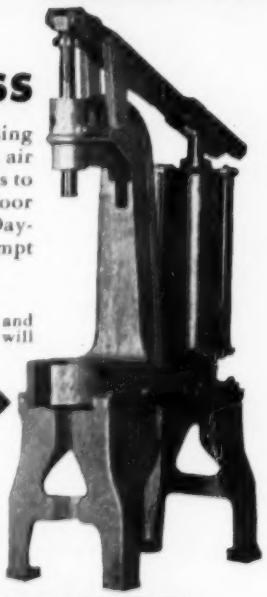

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SABOTAGE is a greater potential danger for most plants than bombing. Have you taken any precautions to guard against it?

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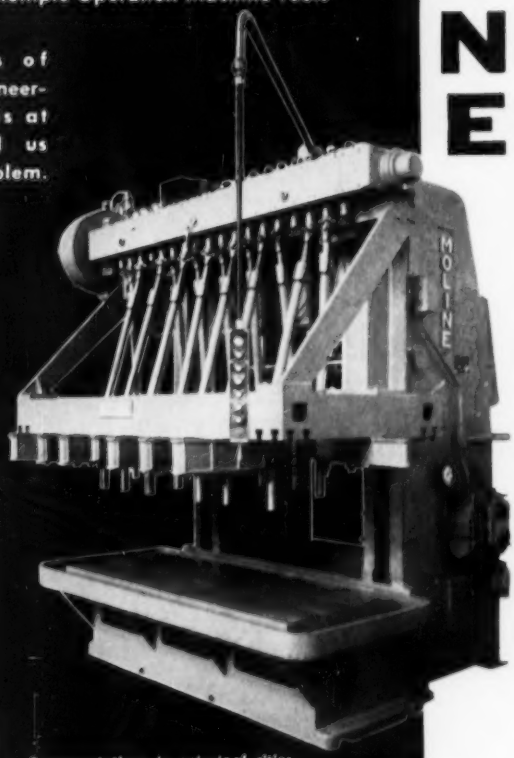


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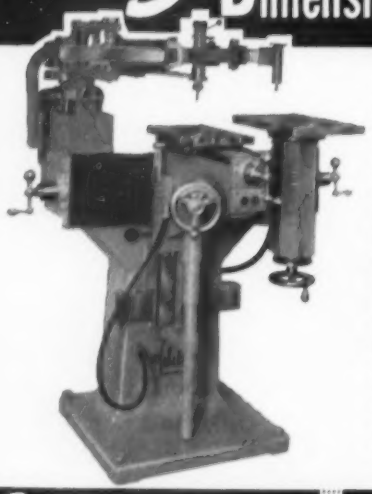

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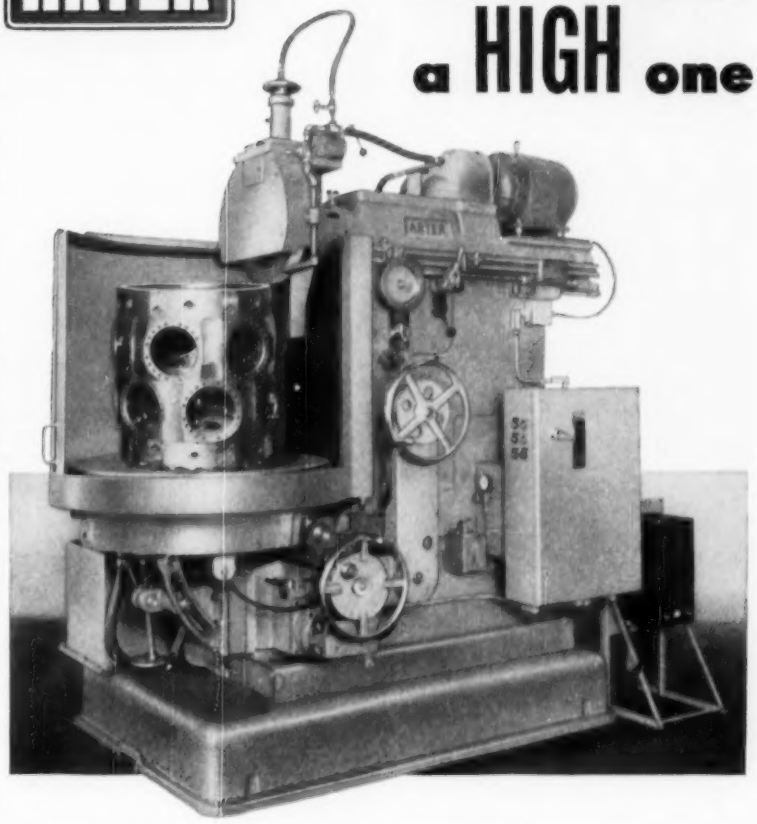

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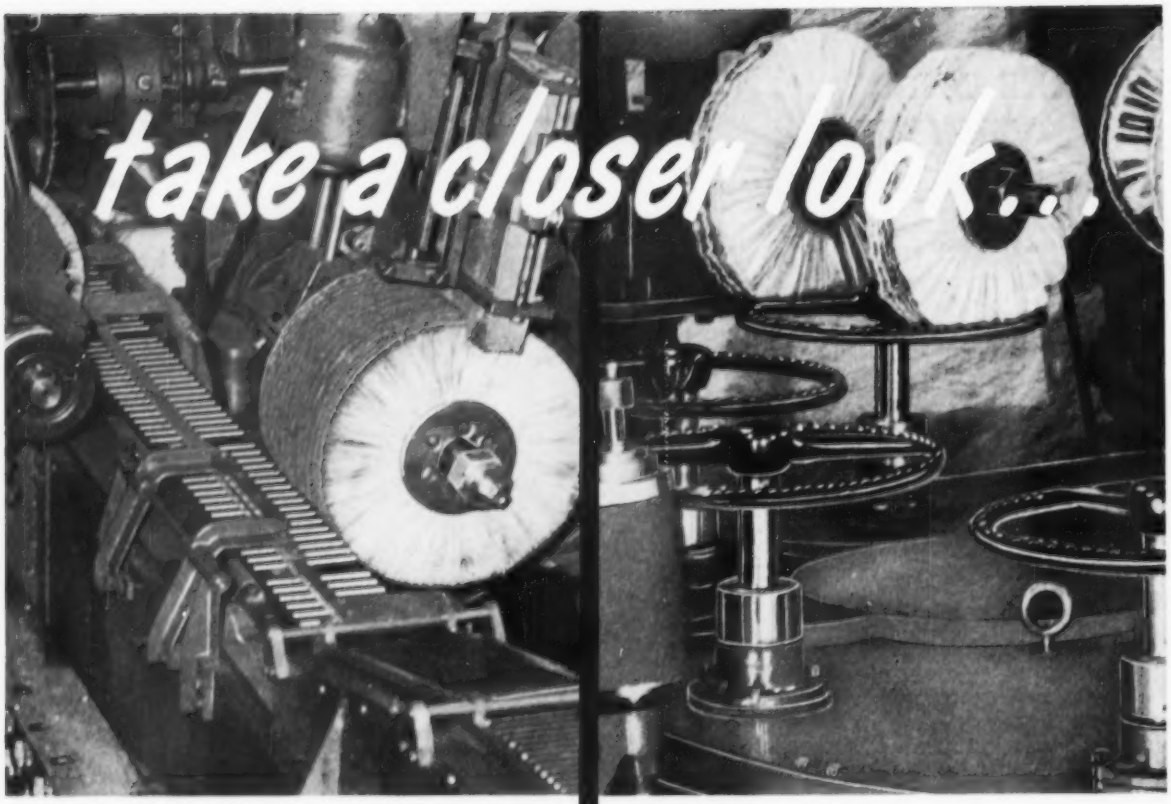


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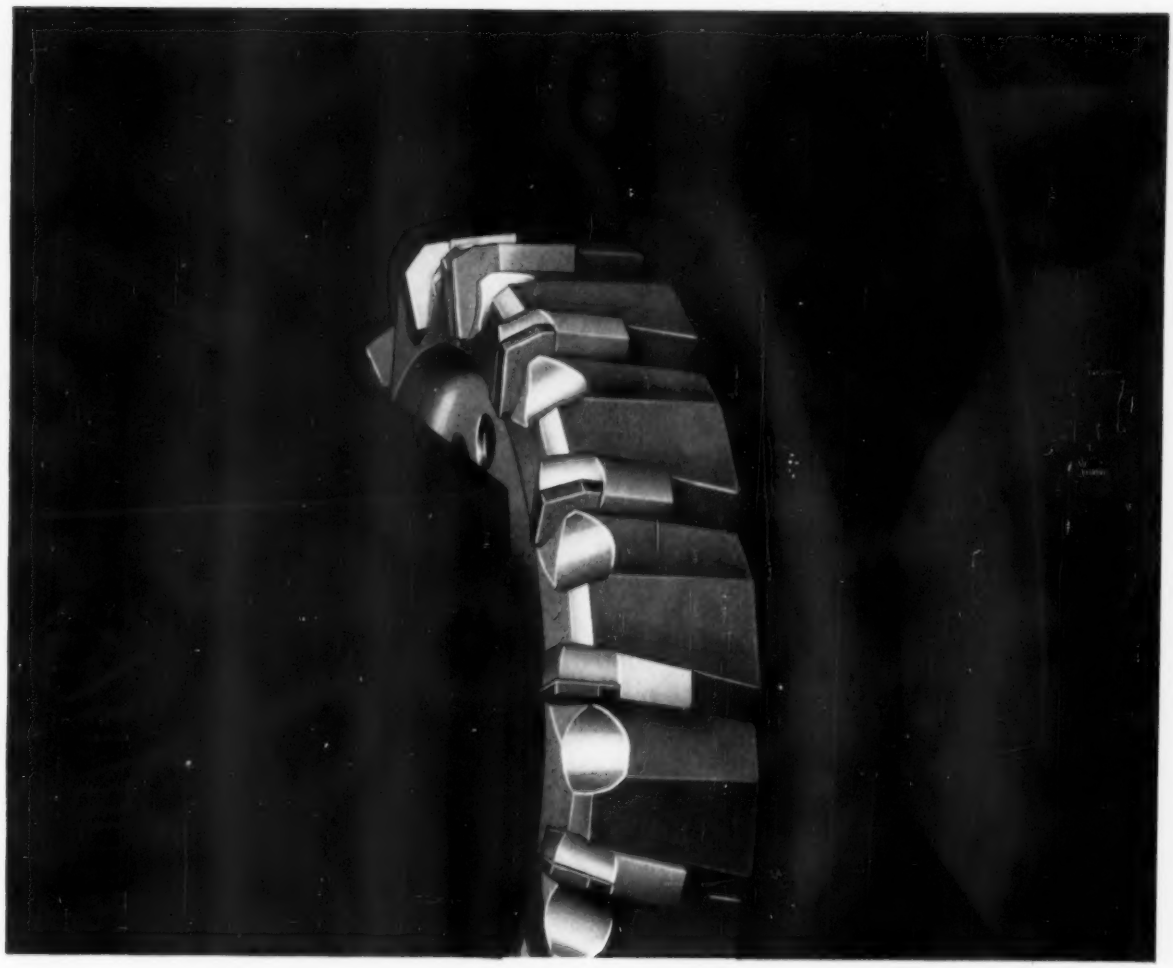

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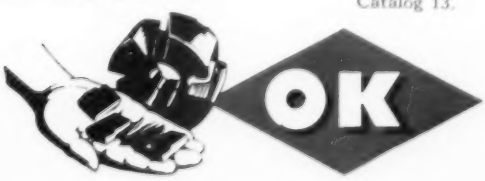


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